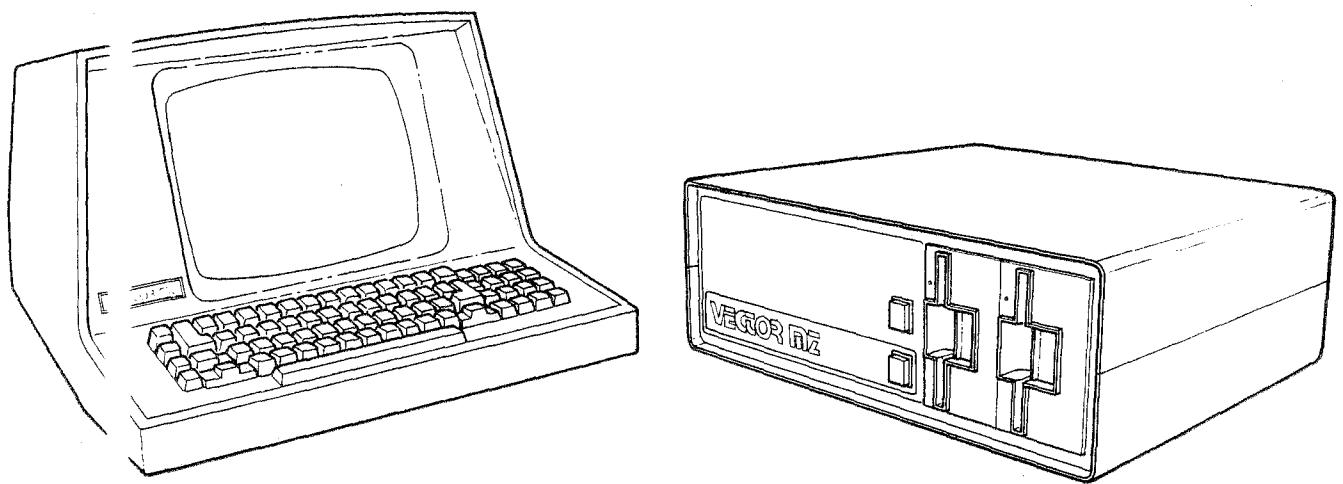
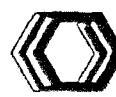


EXTENDED SYSTEMS MONITOR

USER'S GUIDE



 VECTOR GRAPHIC INC.

EXTENDED SYSTEMS MONITOR

Version 4.0

USERS MANUAL

Revision A

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Extended Systems Monitor User's Manual

TABLE OF CONTENTS

| <u>Section</u> | | <u>Page</u> |
|--|--|-------------|
| General Description..... | | 1 |
| Table of Hex values..... | | 2 |
| Command Format | | |
| A - ASCII Dump..... | | 3 |
| B - Jump to Bootstrap Loader | | |
| C - Compare Blocks | | |
| D - Dump in Hex | | |
| E - External Communications | | |
| F - Find Two Bytes..... | | 4 |
| G - Go to and Execute | | |
| H - Jump to HI Ram | | |
| I - Input from a Port | | |
| J - Jump to Loaded DOS | | |
| K - Set Breakpoints..... | | 5 |
| L - Jump to 0000 | | |
| M - Move Memory Block | | |
| N - Non-destructive Memory Test | | |
| O - Output to Port | | |
| P - Program Memory..... | | 6 |
| Q - Compute Checksum | | |
| R - Register Dump | | |
| S - Search for Single Byte | | |
| T - Test Memory..... | | 7 |
| U - Jump to 2B00 | | |
| W - Wide ASCII Dump | | |
| X - Exchange Memory Blocks | | |
| Y - Keyboard Echo | | |
| Z - Zero or Fill Memory..... | | 8 |
| Entry Points..... | | 9 |
| Video Driver..... | | 10 |
| Cursory X Y Positioning..... | | 12 |
| Keyboard Code Conversion for Vector Graphic Keyboards..... | | 12 |
| Using the I/O Routines..... | | 13 |
| Other Useful Monitor Routines..... | | 14 |
| Monitor Listing..... | | 15 - 36 |



GENERAL DESCRIPTION

The Version 4.0 Monitor is a complete systems Monitor, able to support the Flashwriter II (80 X 24) board, and the Vector Graphic Keyboard. Thus it is recommended for use with the Mindless Terminal. All keyboard and video I/O can be done through the Monitor's I/O routines, freeing higher level software from carrying a variety of versions for different hardware configurations. Since version 4.0 does not work with serial terminals, use the 2.1 version for this purpose.

Version 4.0 differs from 3.1 in the following key ways:

- 1) Improved video driver, with a number of additional commands that software can use to manipulate the screen, and easier X-Y positioning.
- 2) A breakpoint executive command, for quick debugging.
- 3) A communications program that allows you to use a Vector Graphic system as a dumb terminal. (Executive command "E").
- 4) Space to include up to 15 keyboard conversions for foreign language keyboards.
- 5) Much easier to use Executive commands.
- 6) Control-Q no longer can be used to return to the Monitor Executive.

In addition to I/O, the Monitor includes an extensive command executive, a compactly written program designed to facilitate manipulation and display of memory data. The "prompt" which indicates that the Monitor Executive is waiting for operator entry is an asterisk (*).

There are 24 commands which are entered as a single letter followed by up to four hexadecimal data fields. After each field is entered, a space is automatically output as a prompt. Either upper or lower case alpha characters may be used, but lower case characters will be converted to upper case, and any non-hex characters will be ignored. Allowable hex characters are 0-9, A-F. Address fields are four digits long; other fields are two digits long. The executive is useful in debugging hardware and software, particularly assembly language software, because it is resident in the system.

If a space is typed at any time during field entry, a default value of zero is assumed for all leading zeroes. This applies to an entire field as well as one that has been partially entered, and the cursor will advance to the next field if required. For example, typing (SP) will have the same effect as typing 0000; typing 100(SP) will have the same effect as 0100.

Any command that generates a display can be temporarily halted with a space and continued with another space. The ESCape key will abort a display or command entry.

The 4.0 Monitor is located at address E000 - E7FF in new Vector Graphic systems. If it is purchased for another location, address references in this manual should be understood accordingly.

The hexadecimal number system may seem confusing if you are not familiar with it, but it has become the standard of the microcomputer field and is clearly the best system with 16 bit addresses and 8 bit data. It is usually not necessary to convert between number systems, as this is usually done by software (i.e. assemblers). Remembering a few values in hex should make things easy:

| HEX NUMBER | DECIMAL VALUE | JARGON | BINARY BITS |
|------------|---------------|--------|-------------|
| A | 10 | | 4 |
| B | 11 | | 4 |
| C | 12 | | 4 |
| D | 13 | | 4 |
| E | 14 | | 4 |
| F | 15 | | 4 |
| 10 | 16 | | 5 |
| FF | 255 | | 8 |
| 100 | 256 | 1 PAGE | 9 |
| 3FF | 1,023 | | 10 |
| 400 | 1,024 | 1K | 11 |
| FFF | 4,095 | | 12 |
| 1000 | 4,096 | 4K | 13 |
| 4000 | 16,384 | 16K | 15 |
| 8000 | 32,768 | 32K | 16 |
| FFFF | 65,535 | 64K-1 | 16 |

The familiar rules of arithmetic work just the same in hex as in decimal:

$$\begin{array}{r} & 10 \\ 40) & 400 \\ & \underline{40} \\ & 00 \end{array} \quad \text{Hex (trivial)}$$

COMMAND FORMAT

***A <ADR1> <ADR2> - ASCII DUMP**

Memory contents from ADR1 through ADR2 will be displayed as ASCII characters, or graphic symbols for values less than 20 hex. If the most significant bit is high, reverse video is displayed. This command is useful for examining files such as those created by the lineditor, BASIC or the WORD MANAGEMENT SYSTEM. ASCII strings embedded in object code are easy to recognize.

***B - JUMP TO BOOTSTRAP LOADER**

Typing this command will cause a jump to location F800H which is the disk bootstrap loader. This will cause the disk operating system disk to be loaded into memory and transfer control to MDOS.

***C <ADR1> <ADR2> <ADR3> - COMPARE BLOCKS**

A byte-by-byte comparison will be made between the block of memory data starting at ADR1 and ending at ADR2 and a block of identical length starting at ADR3. The differences will be printed out with the address, the byte in the first block and the byte in the second block. This command is useful to compare two versions of a program or to verify that proms have been programmed correctly.

***D <ADR1> <ADR2> - DUMP IN HEX**

Memory contents from ADR1 through ADR2 will be displayed as pairs of hexadecimal characters. The left character in each pair represents the four most significant bits of the memory location. The display may be halted and interrupted as described above. The ASCII representation is displayed in a column on the right.

***E - EXTERNAL COMMUNICATIONS**

The monitor will output anything typed on the keyboard through port 4 on the Bitstreamer II I/O board or an appropriately addressed Bitstreamer I board. Anything received on this port will be displayed on the screen. Normally a 300 baud modem would be connected to the serial RS 232 output from the I/O board, and this feature allows the system to be used as a simple terminal to communicate with a host in a full duplex mode. Operation at speeds above 300 baud requires the host to send null characters after linefeeds, so that characters are not lost when the screen scrolls up.

***F <ADR1> <ADR2> <BYTE1> <BYTE2> - FIND TWO BYTES**

This memory range from ADR1 through ADR2 will be searched for the particular code combination BYTE 1 BYTE 2. This is useful for locating particular commands or jump addresses. For example, if you wish to change a control character (say control D) in a program you may try FE 04, which is CPI 04 since this is a common way of testing input characters. If you wish to find all locations that call or jump to a particular address, say C700, then search for 00C7. There is no guarantee that each location displayed is valid object code - it may be part of a data table, ASCII string, or second and third bytes of a three byte instruction.

***G <ADR1> - GO TO AND EXECUTE**

This command will cause a jump to ADR1 to execute a program or user subroutine. As with all Monitor jump commands, the address contained on the stack is "START" (C00B) and if the user routine at ADR1 ends in "RET", program execution will return to the Monitor. Virtually unlimited stack space is available (up to 1K), but of course, pushing more registers on the stack than are popped will defeat the return feature with undesirable effects.

***H - JUMP TO HI RAM**

This command jumps to FC00 which is the start of the 1K scratchpad RAM. This is a useful area for small machine language programs.

***I <PORT> - INPUT FROM A PORT**

Execution of this command will cause the CPU to execute an "IN PORT" instruction and the accumulator contents immediately following this to be displayed. This command is useful in checking out peripheral equipment. Only those ports used by the terminal, cassette interface, etc., will contain interesting values. All others will read FF since the data bus will be floating when the "IN" command is executed.

***J - JUMP TO LOADED DOS**

This command permits easy return to the MDOS disk operating system at 0437H, or if not present, jump will be 0437H, which is the MDOS entry location and is subject to change in future releases.

***K - SET BREAKPOINTS**

This command expects a 4 digit address, and will place a RESTART 7 (FF) at that location in RAM. When that instruction is executed, which is a call to location 8, the CPU will jump to the monitor routine that dumps the register contents. The instruction replaced with FF will also be restored. Entry of the monitor at E000 will clear the breakpoint, as will pressing the RESET switch.

***M <ADR1> <ADR2> <ADR3> - MOVE MEMORY BLOCK**

The data contained in memory starting at ADR1 and ending at ADR2 is moved to memory locations starting at ADR3. This command is useful for moving a program from a temporary storage location to its correct address. If there is an overlap of the two memory areas, interesting results are obtained. For example, M 6000 7BFF 6400 will cause the block of data from 6000 through 63FF to be repeated 8 times from 6000 through 7FFF, since by the time location 6400 is read, it has been overwritten with data from 6000. This is useful for bank programming of proms, or for creating repeating instruction sequences for test purposes.

***N - NON-DESTRUCTIVE MEMORY TEST**

Memory locations starting at 0000 are read and the data temporarily stored. The memory location is then tested to see if 00 and FF can be written and read correctly. This continues after rewriting the original data until the first error is detected, whereupon the address is displayed followed by the data written into memory and what was read from it. This command is most useful for checking how much memory a system contains. For example, if the system contains 16K of memory, 4000 00 FF should be printed, indicating that there is no memory at address 4000. Since the test is non-destructive to data in memory, it can be used at any time.

***O <PORT> <DATA> - OUTPUT TO PORT**

The two hex digits "DATA" are loaded into the accumulator and the instruction "OUT PORT" is executed. This command is useful for checking our peripheral equipment. For example, if a printer is connected to I/O port 6, 0 06 41 will cause an "A" to be printed since 41 is the hex ASCII code for "A".

***P <ADR1> - PROGRAM MEMORY**

The contents of 16 bytes of memory containing ADR1 are displayed in both hex and ASCII, allowing preceding and following instructions to be viewed. Advancing to the next instruction is accomplished by typing space or cursor right (\rightarrow). Backspace or cursor left (\leftarrow) goes backwards. The cursor up and down keys move to an adjacent 16 byte block. Any hex characters typed will replace the existing contents of RAM. After every keypress, the screen display is refreshed by reading from memory, so the display reflects the exact memory contents. To terminate, depress ESCAPE.

***Q <ADR1> <ADR2> - COMPUTE CHECKSUM**

The MOD 256 checksum of memory contents in the address range specified is computed and displayed. This command is useful for checking proms or files to see if anything has changed. Any source file or program written in pure code (it does not write on itself) will have the same checksum as when it was loaded. While debugging assembly language programs, it is useful to be able to verify that a program being debugged has not written garbage in the source file or assembler.

***R - REGISTER DUMP**

This command will print a header identifying the Z-80 registers, and immediately below it the contents of all the registers. The flags are displayed with the letters Z C M E H for the zero, carry, minus, parity even, and auxiliary or half carry flags respectively. The presence of the letter indicates the flag is true. The contents of the memory locations pointed to by the B, D, and H register pairs are also displayed as is the return address on the stack.

***S <ADR1> <ADR2> <BYTE> - SEARCH FOR SINGLE BYTE**

This is similar to the "F" command, except that only one byte is searched for instead of two. An example of the use of this command is to display all locations in a program where an output to a port occurs (D3). The address of each location will be displayed followed by "D3" and the next byte (the port number).

Extended Systems Monitor User's Manual

***T <ADR1> <ADR2> - TEST MEMORY**

This is an extremely useful command, especially when first setting up a system. This command permits thorough testing of the system memory. A portion of a 64K byte pseudorandom number sequence is written into memory from ADR1 through ADR2, and the exact same sequence is regenerated from the initial point and compared with what is read from memory. If all locations compare, another portion of the sequence is used to repeat the test which continues until it is interrupted. Any memory errors are displayed with the address, what was written into memory and what was read from memory, respectively. This information is all that is needed to pinpoint a malfunctioning memory chip. This test is quite exhaustive if used for at least 10 cycles and is far superior to incrementing or complementing tests which may not reveal addressing problems. The only area of system memory that cannot be tested with this routine is the few bytes required for the stack and video flags in the vicinity of FFD0 on the 2708 PROM/RAM board.

***U - JUMP TO 2B00**

This command permits easy return to programs in the user application area of MDOS.

***W <ADR1> <ADR2> - WIDE ASCII DUMP**

This is similar to the "A" command, but with a full screen width display.

***X <ADR1> <ADR2> <ADR3> - EXCHANGE MEMORY BLOCKS**

A block of memory from ADR1 through ADR2 is exchanged with an equal length block starting at ADR3. This command is useful in comparing the operation of two versions of a program, or for rapid switching of portions of a program without destroying the original. A loaded BASIC program can be exchanged with another if care is used to include the stack area (usually below the top of allowed memory).

***Y - KEYBOARD ECHO**

This command causes keyboard input to be echoed directly to the video driver and can be used for demonstration purposes. An ESCape returns to the Monitor.

***Z <ADR1> <ADR2> <DATA> - ZERO OR FILL MEMORY**

The memory block from ADR1 through ADR2 is filled with the byte "DATA". This is useful for setting memory to Zero. The end of a file or assembled program will stand out more clearly if memory is first zeroed. For test purposes, single instructions can be executed continuously so that bus waveforms are more easily interpreted. This is done by filling a block of memory with a repeated instruction sequence with a jump to the start of the block so that the program loops continuously.

ENTRY POINTS

A jump table at the beginning of the Monitor can be used to access several routines:

E000 - The normal cold entry point to the Monitor Executive, this is a jump to the initialization routine which clears the screen and initializes 8251 USARTS through I/O ports 3, 5, and 7. This is compatible with the Bitstreamter I addressed starting at port 4 or the Bistreamer II addressed starting at port 2. The USARTS are set for an X16 baud rate factor and other parameters as would be used with a serial printer or extra terminal.

E003 - This is a jump to the routine which should be used for console keyboard status test. Return with the zero flag set indicates no keyboard input.

E006 - This is a jump to the keyboard data input which returns with the character in the "A" register. The keyboard code conversions described below are carried out. There is no checking for ESC key depression.

E009 - This is a jump to the video driver which displays the character in "A" on the screen.

E00C - This is a jump to the "ESCAPE" routine which returns zero if no input, or with the character in the "A" register if there is. Keyboard code conversions are carried out. If the ESC key was pressed, the system returns to the Monitor Executive.

VIDEO DRIVER

Version 4 of the Monitor contains a more elaborate video driver than previous versions. The purpose of the video driver is to accept a stream of ASCII codes, and to write them into the screen memory in the proper place, interpreting certain non printing control codes in a special way. There are several entry points to the video driver. E009 is recommended. The character code to be printed must be in the A register. A CALL E009 will cause the character to be printed on the screen at the cursor position. All registers will be preserved.

Control codes are generated by the keyboard by holding the control (CTRL) key down while a letter key is pressed. Control codes have values between 0 and 31, and are 64 less than the codes for the corresponding upper case letters. To demonstrate the features of the video driver, type Y after the Monitor prompt, and any keyboard generated code will be echoed to the video driver. The following control codes are interpreted as special functions, while all others are ignored:

- (B) HOME THE CURSOR
- (D) CLEAR THE SCREEN AND HOME CURSOR
- (E) DISPLAY THE CODE IN B REGISTER
- (H) DESTRUCTIVE BACKSPACE (also BACKSPACE key)
- (I) TAB OVER TO THE NEXT 8 MULTIPLE (also TAB)
- (J) LINEFEED (also LF Key)
- (M) CARRIAGE RETURN (also RETURN key)
- (N) TOGGLE CURSOR
- (P) CLEAR TO END OF SCREEN
- (Q) CLEAR TO END OF LINE
- (R) CURSOR DOWN (also ↓)
- (T) TOGGLE REVERSE VIDEO
- (U) CURSOR UP (also ↑)
- (W) CURSOR LEFT (also ←)
- (X) CLEAR TO START OF LINE
- (Z) CURSOR RIGHT (also →)
- ESC CURSOR XY POSITION LEAD-IN

Experiment with the keys. There are special keys on the keyboard to generate some of the codes such as RETURN, TAB and linefeed (LF). If you are using the Vector Graphic Keyboard or Mindless Terminal, there are also keys for the cursor control and BACKSPACE. A few of the functions are not self explanatory. A Control D sets the reverse video flag to normal in addition to clearing the screen and homing the cursor. A Control T will then toggle the reverse video flag from normal to reverse and back without printing on the screen.

Extended Systems Monitor User's Manual

In some cases it is desireable to print the symbol for a control code on the screen. This can be done in assembly language programs by putting the code for the symbol in the B register and calling the video driver with Control E (05) in A. Enter the following machine code at FC00 and execute it to demonstrate this feature:

```
at FC00  06 02 3E 05 04 CD 09 E0 CD OC E0 C3 02 FC
```

CURSOR X Y POSITIONING

Many programs utilize random X Y positioning of the cursor. This is done by outputting a three byte sequence to the video driver. The first code is ESC (1BH) followed by the desired X position and Y position in hex. The top left corner of the screen is 0, 0. The sequence 1B 08 40 would cause the cursor to move to line 8, character position 64 on the screen. This feature can not be demonstrated using the keyboard since ESC causes a return to the monitor.

The video driver provides an extensive range of special controls, however, they must be incorporated into the software generating the video stream to be meaningful. For instance a piece of software that merely echoes all characters as they go into its input buffer will allow cursor motion on the screen, but this will probably be meaningless to the software.

KEYBOARD CODE CONVERSION - VECTOR GRAPHIC KEYBOARDS

Due to limitations in the keyboard encoder chip, the [] key on Vector Graphic keyboards is not encoded properly. The correct code is generated by a conversion routine in the Monitor's CONVERT routine. The codes for backslash and tilde are also produced by the control and control shift mode of this key.

[] KEY CONVERSION:

| MODE | KEYCODE | CONVERTED CODE | ASCII SYMBOL |
|---------------|---------|----------------|--------------|
| unshifted | F1 | 5B | [|
| shifted | E1 | 5D |] |
| control | B1 | 5C | \ |
| control shift | A1 | 7E | ~ |

The cursor up key is also converted from 60H to 15H which is interpreted correctly by the video driver. Room is provided in the routine for up to 15 keycode conversions. Foreign languages require additional conversions, and versions are available for French, German, Swedish and Spanish. It is essential that software utilize the monitor conversion routine for this reason.

USING THE I/O ROUTINES

The I/O routines in the Monitor are used as the Main System I/O in Vector Graphic Systems. This makes software I/O independent and easily interchangeable between systems. An example of how this is done is shown below:

| | | |
|-----------------|-------|---|
| INPUT ROUTINE: | INPT | CALL E00CH JZ INPT RET (RETURNS WITH CHAR INPUT IN A) |
| OUTPUT ROUTINE: | OUTPT | JMP E009H (CHARACTER IN A) |
| BREAK TEST: | CCNTL | CALL E00CH RET (RETURNS WITH ZERO FLAG SET IF NO INPUT, OR CHARACTER IN A. JUMPS TO MONITOR EXECUTIVE IF ESCAPE INPUT.) |

Note that either the ESC key will break to the Monitor, which provides a convenient way of transferring control from any executive such as the DOS or BASIC to the Monitor, but necessitates the use of another character (Control C is standard) for a single level break. The routines above are merely given to illustrate how simple it is to use the Monitor I/O routines. Many programs require additional instructions to move the character to be output into the accumulator, or may require different flag conditions or accumulator contents on return from the input and Break Test routine, but the variations are easily implemented.

OTHER USEFUL MONITOR ROUTINES

The Monitor contains a number of routines that can be called by user programs, and which will save considerable programming effort. In addition to the keyboard input and video output described elsewhere, we have:

AHEX inputs four hex digits from the keyboard and returns the binary value in D,E registers. A space is automatically output at the end. All registers, except B, are used. Entry at AHEO with a value of 1-3 in C will convert that many digits. Non hex values will be ignored.

CRLF will output a carriage return and line feed to the screen. The A register is used.

SPCE will output a space to the screen. The A register is used.

RNDM returns a new random number in B,C based on the seed in B,C as it is called. B,C should not contain 0000. The pseudorandom number sequence generated is $2^{16}-1$ entries long and is based on a software simulation of a shift register with maximum length feedback. PSW is used.

PTAD first outputs a CRLF, then outputs the binary value in H,L as four hex digits followed by a space. PSW used.

PT2 outputs (A) as two hex digits.

TAHEX calls AHEX twice, inputting two address fields of four hex digits. The first value is returned in H,L; the second in D,E.

Extended Systems Monitor User's Manual

Page 1

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opnd | Operand |
|------|----|------|----|------|---------|------|-------|-----------------------|--|
| 0000 | | E000 | = | 0000 | BASE | | | EQU | 0E000H ;ASSEMBLY ADDRESS |
| 0000 | | E000 | = | 0010 | PR | | | EQU | 0E000H ;PROM/RAM ADDRESS |
| 0000 | | | | 0020 | | | LINK | 'M6' | |
| 0000 | | | | | | 0000 | ***** | ***** | VECTOR MZ MONITOR - VERSION 4.0 ***** |
| 0000 | | | | | | 0010 | * | | R. S. HARP 7/16/79 * |
| 0000 | | | | | | 0020 | * | | SYSTEM 3 VERSION * |
| 0000 | | | | | | 0030 | * | | ASSEMBLES AT C OR E * |
| 0000 | | | | | | 0040 | * | | ONLY FOR FLASHWRITER II * |
| 0000 | | | | | | 0050 | ***** | ***** | ***** |
| 0000 | | | | | | 0060 | * | | |
| 0000 | | | | | | 0070 | * | | SYSTEM EQUATES |
| 0000 | | 0000 | = | 0080 | CONS | | EQU | 0 | ;CONS STATUS PRT |
| 0000 | | 0001 | = | 0090 | COND | | EQU | 1 | ;CONS DATA PORT |
| 0000 | | 0040 | = | 0100 | RDA | | EQU | 40H | ;RECEIVE FLAG |
| 0000 | | 0000 | = | 0110 | STPOL | | EQU | 0 | ;STATUS POLARITY |
| 0000 | | FFD0 | = | 0120 | SPTR | | EQU | PR+01FD0H | ;STACK POINTER |
| 0000 | | | | 0130 | * | | | | |
| 0000 | | | | 0140 | ***** | | ***** | ***** | COMMAND FORMAT ***** |
| 0000 | | | | 0150 | * | | | | * A SSSS FFFF ASCII DUMP OF MEMORY * |
| 0000 | | | | 0160 | * | | | | * B JUMP TO BOOTSTRAP LOADER * |
| 0000 | | | | 0170 | * | | | | * C SSSS FFFF CCCC COMPARE BLOCKS * |
| 0000 | | | | 0180 | * | | | | * D SSSS FFFF DUMP MEMORY IN HEX & ASCII * |
| 0000 | | | | 0190 | * | | | | * E EXTERNAL COMMUNICATIONS * |
| 0000 | | | | 0200 | * | | | | * F SSSS FFFF DD DD TWO BYTE SEARCH * |
| 0000 | | | | 0210 | * | | | | * G SSSS GO TO AND EXECUTE * |
| 0000 | | | | 0220 | * | | | | * H JUMP TO HIGH RAM AT FC00 * |
| 0000 | | | | 0230 | * | | | | * I PP INPUT FROM PORT * |
| 0000 | | | | 0240 | * | | | | * J JUMP TO DOS * |
| 0000 | | | | 0250 | * | | | | * K LLLL SET A BREAKPOINT * |
| 0000 | | | | 0255 | * | | | | * L JUMP TO LOW RAM AT 0 * |
| 0000 | | | | 0260 | * | | | | * M SSSS FFFF DDDD MOVE BLOCK * |
| 0000 | | | | 0270 | * | | | | * N NON DESTRUCTIVE MEMORY TEST * |
| 0000 | | | | 0280 | * | | | | * O PP DD OUTPUT TO PORT * |
| 0000 | | | | 0290 | * | | | | * P LLLL PROGRAM MEMORY * |
| 0000 | | | | 0300 | * | | | | * Q SSSS FFFF COMPUTE CHECKSUM * |
| 0000 | | | | 0310 | * | | | | * R DUMP Z-80 REGISTERS * |
| 0000 | | | | 0320 | * | | | | * S SSSS FFFF DD SEARCH FOR SINGLE BYTE * |
| 0000 | | | | 0330 | * | | | | * T SSSS FFFF TEST MEMORY * |
| 0000 | | | | 0340 | * | | | | * U JUMP TO USER AREA AT 2800 * |
| 0000 | | | | 0350 | * | | | | * X SSSS FFFF DDDD EXCHANGE BLOCK * |
| 0000 | | | | 0360 | * | | | | * Y KEYBOARD ECHO * |
| 0000 | | | | 0370 | * | | | | * Z SSSS FFFF DD ZERO OR FILL MEMORY * |
| 0000 | | | | 0380 | ***** | | ***** | ***** | ***** |
| 0000 | | | | 0390 | * | | | | |
| 0000 | | | | 0400 | | | ORG | BASE | |
| 0000 | | | | 0410 | * | | JUMP | TABLE OF ENTRY POINTS | |
| E000 | C3 | 16 | E0 | 0420 | MONIT | | JMP | INIT | ;INITIALIZE ALL |
| E003 | C3 | 3C | E1 | 0430 | KEYTST | | JMP | KEYSTAT | ;TEST KEYBOARD |
| E006 | C3 | 41 | E1 | 0440 | KEYDATA | | JMP | CONVERT | ;INPUT KEYBOARD |
| E009 | C3 | 3A | E3 | 0450 | CRT | | JMP | VIDEO | ;OUTPUT TO SCREEN |
| E00C | C3 | 2F | E1 | 0455 | ESC | | JMP | ESCAPE | ;KEYBOARD INPUT |
| E00F | | | | 0460 | * | | | | |
| E00F | D3 | 03 | | 0470 | OTPRTS | | OUT | 3 | |
| E011 | D3 | 05 | | 0480 | | | OUT | 5 | |
| E013 | D3 | 07 | | 0490 | | | OUT | 7 | |
| E015 | C9 | | | 0500 | | | RET | | |

Extended Systems Monitor User's Manual

Page 2

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opcd | Operand | |
|------|----|----|----|----|---|-------------------------|------|-------------|-------------------|
| E016 | 31 | 00 | FF | | | 0510 INIT | LXI | SP,SPTR | ;INIT STACK |
| E019 | CD | 2F | E1 | | | 0520 | CALL | ESCAPE | ;DUMP LATCH |
| E01C | AF | | | | | 0530 | XRA | A | |
| E01D | 32 | EA | FF | | | 0535 | STA | XYFLAG | |
| E020 | CD | 0F | E0 | | | 0540 | CALL | OTPRTS | |
| E023 | CD | 0F | E0 | | | 0550 | CALL | OTPRTS | |
| E026 | CD | 0F | E0 | | | 0560 | CALL | OTPRTS | |
| E029 | 3E | 40 | | | | 0570 | MVI | A,40H | ;RESET USART |
| E02B | CD | 0F | E0 | | | 0580 | CALL | OTPRTS | |
| E02E | 3E | C2 | | | | 0590 | MVI | A,0CEH | ;MODE |
| E030 | CD | 0F | E0 | | | 0600 | CALL | OTPRTS | |
| E033 | 3E | 27 | | | | 0610 | MVI | A,27H | ;COMMAND |
| E035 | CD | 0F | E0 | | | 0620 | CALL | OTPRTS | |
| E038 | | | | | | 0630 * PATCH RST 7 | | | |
| E038 | 3E | C3 | | | | 0640 | MVI | A,0C3H | ;JUMP |
| E03A | 32 | 38 | 00 | | | 0650 | STA | 38H | ;RST 7 |
| E03D | 21 | DB | E6 | | | 0660 | LXI | H,DUMPREGS | |
| E040 | 22 | 39 | 00 | | | 0670 | SHLD | 39H | |
| E043 | | | | | | 0680 * DISPLAY SIGN ON | | | |
| E043 | CD | DC | E4 | | | 0690 | CALL | SIGN | |
| E046 | 2A | E7 | FF | | | 0700 * CLEAR BREAKPOINT | | | |
| E049 | 11 | E9 | FF | | | 0710 CLRBRK | LHLD | BKPTLOC | |
| E04C | ED | 53 | E7 | FF | | 0720 | LXI | D,BRKCODE | |
| E050 | 1A | | | | | 0730 | SDED | BKPTLOC | |
| E051 | 77 | | | | | 0740 | LDAX | D | |
| E052 | 31 | 00 | FF | | | 0750 | MOV | M,A | |
| E055 | CD | 38 | E5 | | | 0755 START | LXI | SP,SPTR | ;INITIALIZE STACK |
| E058 | CD | 2F | E1 | | | 0760 | CALL | PROMPT | |
| E053 | 23 | F9 | | | | 0770 | CALL | ESCAPE | ;READ KEYBOARD |
| E05D | 26 | 5F | | | | 0780 | JRZ | START+6 | |
| E05F | 21 | 52 | E0 | | | 0790 | ANI | 5FH | ;UPPER AND LOWER |
| E062 | E5 | | | | | 0800 | LXI | H,START | |
| E063 | FE | 04 | | | | 0810 | PUSH | H | |
| E065 | CC | 8A | E3 | | | 0820 | CPI | 'D'-64 | |
| E063 | FE | 41 | | | | 0830 | CZ | VIDEO | ;ECHO CLEARSCN |
| E06A | D3 | | | | | 0840 | CPI | 'A' | |
| E06B | FE | 5B | | | | 0850 | RC | | ;TOO SMALL |
| E06D | DO | | | | | 0860 | CPI | 0SBH | |
| E06E | 21 | F9 | E0 | | | 0870 | RNC | | ;TOO LARGE |
| E071 | F5 | | | | | 0880 | LXI | H,CMDTB+7EH | |
| E072 | 87 | | | | | 0890 | PUSH | PSW | |
| E073 | 35 | | | | | 0900 | ADD | A | |
| E074 | 65 | | | | | 0910 | ADD | L | |
| E075 | 5E | | | | | 0920 | MOV | L,A | |
| E076 | 23 | | | | | 0930 | MOV | E,M | |
| E077 | 56 | | | | | 0940 | INX | H | |
| E073 | EB | | | | | 0950 | MOV | D,M | |
| E079 | F1 | | | | | 0960 | KCHG | | |
| E07A | E9 | | | | | 0970 | POP | PSW | |
| E07B | | | | | | 0980 | PCNL | | ;AWAY WE GO |
| E07B | 47 | E5 | | | | 0990 * COMMAND TABLE | | | |
| E07D | 47 | E2 | | | | 1000 CMDTB | DW | WASCII | ;A |
| E07F | F1 | E2 | | | | 1010 | DW | BOOT | ;B |
| E081 | CB | E5 | | | | 1020 | DW | COMPR | ;C |
| E083 | E0 | E7 | | | | 1030 | DW | HEXRUL | ;D |
| | | | | | | 1040 | DW | EXTCOM | ;E |

Extended Systems Monitor User's Manual

Page 3

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opcd | Operand |
|------|----|----|----|----|---|------|--|------|------------------------|
| E085 | 14 | E3 | | | | 1050 | | DW | FIND ;F |
| E087 | AF | E0 | | | | 1060 | | DW | EXEC ;G |
| E089 | 65 | E2 | | | | 1070 | | DW | RAM ;H |
| E08B | 62 | E3 | | | | 1080 | | DW | PINPT ;I |
| E08D | 96 | E1 | | | | 1090 | | DW | WARM ;J |
| E08F | C5 | E7 | | | | 1100 | | DW | SETBRK ;K |
| E091 | 71 | E2 | | | | 1110 | | DW | LORAM ;L |
| E093 | A5 | E2 | | | | 1120 | | DW | MOVEB ;M |
| E095 | CD | E2 | | | | 1130 | | DW | NDMT ;N |
| E097 | 74 | E3 | | | | 1140 | | DW | POUTP ;O |
| E099 | 18 | E6 | | | | 1150 | | DW | PROGRAM ;P |
| E09B | 79 | E1 | | | | 1160 | | DW | CHKSM ;Q |
| E09D | CF | E6 | | | | 1170 | | DW | DREGS ;R |
| E09F | 21 | E3 | | | | 1180 | | DW | SRCH ;S |
| EOA1 | C3 | E1 | | | | 1190 | | DW | TMEM ;T |
| EOA3 | 56 | E2 | | | | 1200 | | DW | USER ;U |
| EOA5 | 52 | E0 | | | | 1210 | | DW | START ;V |
| EOA7 | 52 | E0 | | | | 1220 | | DW | START ;W |
| EOA9 | 96 | E2 | | | | 1230 | | DW | EXCHG ;X |
| EOAB | AE | E1 | | | | 1240 | | DW | ECHO ;Y |
| EOAD | 7D | E2 | | | | 1250 | | DW | ZEROM ;Z |
| EOAF | | | | | | 1260 | * | | |
| EOAF | | | | | | 1270 | *** EXECUTE THE PROGRAM AT THE ADDRESS *** | | |
| EOAF | | | | | | 1280 | * | | |
| EOAF | CD | D1 | E4 | | | 1290 | EXEC | CALL | PTSTNG |
| EOB2 | 47 | 4F | 20 | 54 | | 1300 | | DTH | 'GO TO ' |
| EOB6 | 4F | A0 | | | | | | | |
| EOB8 | CD | BD | E0 | | | 1310 | | CALL | AHEX ;READ ADD FROM KB |
| EOBB | EB | | | | | 1320 | | XCHG | |
| EOBC | E9 | | | | | 1330 | | PCHL | ;JUMP TO IT |
| EOBD | | | | | | 1340 | * | | |
| EOBD | | | | | | 1350 | *** CONVERT UP TO 4 HEX DIGITS TO BIN | | |
| EOBD | | | | | | 1360 | * | | |
| EOBD | 0E | 04 | | | | 1370 | AHEX | MVI | C,4 ;COUNT OF 4 DIGIT |
| EOBF | 21 | 00 | 00 | | | 1380 | AHE0 | LXI | H,0 ;16 BIT ZERO |
| EOC2 | CD | 2F | E1 | | | 1390 | AHE1 | CALL | ESCAPE |
| EOC5 | FE | 20 | | | | 1400 | | CPI | ' ' |
| EOC7 | CA | E8 | E0 | | | 1410 | | JZ | SPCOVR |
| EOCA | CD | ED | E0 | | | 1420 | | CALL | HEX ;CHECK VALUE |
| EOCD | 38 | F3 | | | | 1430 | | JRC | AHE1 |
| EOCF | 29 | | | | | 1440 | | DAD | H ;MULT H*16 |
| EOD0 | 29 | | | | | 1450 | | DAD | H |
| EOD1 | 29 | | | | | 1460 | | DAD | H |
| EOD2 | 29 | | | | | 1470 | | DAD | H |
| EOD3 | 35 | | | | | 1480 | | ADD | L |
| EOD4 | 6F | | | | | 1490 | | MOV | L,A |
| EOD5 | 0D | | | | | 1500 | | DCR | C |
| EOD6 | C2 | C2 | E0 | | | 1510 | | JNZ | AHE1 ;4 DIGITS? |
| EOD9 | EB | | | | | 1520 | | XCHG | |
| EODA | 3E | 20 | | | | 1530 | SPCE | MVI | A,20H ;PRINT SPACE |
| EODC | C3 | 8A | E3 | | | 1540 | PTCN | JMP | VIDEO |
| EODF | 3E | 0D | | | | 1550 | CRLF | MVI | A,0DH ;PRINT CR |
| EOE1 | CD | DC | E0 | | | 1560 | | CALL | PTCN |
| EOE4 | 3E | 0A | | | | 1570 | | MVI | A,0AH |
| EOE6 | 18 | F4 | | | | 1580 | | JR | PTCN |
| EOE8 | | | | | | 1590 | * | | |

Extended Systems Monitor User's Manual

Page 4

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opcd | Operand |
|------|----|----|----|----|---|------|------------------------------------|------|------------------------|
| E0E8 | CD | 8A | E3 | | | 1600 | SPCOVR | CALL | VIDEO |
| E0EB | 18 | EC | | | | 1610 | | JR | SPCE-1 |
| E0ED | | | | | | 1620 | * | | |
| E0ED | | | | | | 1630 | * CHECK FOR HEX VALUE, CONVERT | | |
| E0ED | FE | 30 | | | | 1640 | HEX | CPI | 30H ;<0 |
| E0EF | D8 | | | | | 1650 | | RC | |
| E0F0 | FE | 3A | | | | 1660 | | CPI | ':'; >9 |
| E0F2 | 38 | 09 | | | | 1670 | | JRC | NUM |
| E0F4 | 36 | 5F | | | | 1675 | | ANI | 5FH ;UPPER & LOWER CAS |
| E0F6 | FE | 41 | | | | 1680 | | CPI | 'A'; <A |
| E0F8 | D8 | | | | | 1690 | | RC | |
| E0F9 | FE | 47 | | | | 1700 | | CPI | 'G'; >F |
| E0FB | 3F | | | | | 1710 | | CMC | |
| E0FC | D8 | | | | | 1720 | | RC | |
| E0FD | CD | 8A | E3 | | | 1730 | NUM | CALL | VIDEO |
| E100 | D6 | 30 | | | | 1740 | | SUI | 48 ;ASCII BIAS |
| E102 | FE | 0A | | | | 1750 | | CPI | 10 ;DIGIT 0-10 |
| E104 | 38 | 02 | | | | 1760 | | JRC | ALFA |
| E106 | D6 | 07 | | | | 1770 | | SUI | 7 ;ALPHA BIAS |
| E108 | A7 | | | | | 1780 | ALFA | ANA | A ;CLEAR CY |
| E109 | C9 | | | | | 1790 | | RET | ;WITH CY CLEAR |
| E10A | | | | | | 1800 | * | | |
| E10A | | | | | | 1810 | * READ 2 DIGITS FROM THE CONSOLE | | |
| E10A | 0E | 02 | | | | 1820 | AHE2 | MVI | C,2 |
| E10C | 18 | B1 | | | | 1830 | | JR | AHEO |
| E10E | | | | | | 1840 | * | | |
| E10E | | | | | | 1850 | * SHORT ROUTINE TO SAVE CODE. | | |
| E10E | CD | BD | E0 | | | 1860 | TAHEX | CALL | AHEX |
| E111 | 18 | AA | | | | 1870 | | JR | AHEX |
| E113 | | | | | | 1880 | * | | |
| E113 | | | | | | 1890 | *** READ FROM CONSOLE TO REG A *** | | |
| E113 | | | | | | 1900 | * | | |
| E113 | CD | 2F | E1 | | | 1910 | RDCN | CALL | ESCAPE ;READ KEYBOARD |
| E116 | 28 | FB | | | | 1920 | | JRZ | RDCN |
| E118 | FE | 60 | | | | 1930 | | CPI | 60H |
| E11A | 38 | CO | | | | 1940 | | JRC | PTCN |
| E11C | E6 | 5F | | | | 1950 | | ANI | 5FH |
| E11E | 18 | BC | | | | 1960 | | JR | PTCN |
| E120 | | | | | | 1970 | * | | |
| E120 | CD | 2F | E1 | | | 1980 | PAUSE | CALL | ESCAPE |
| E123 | FE | 20 | | | | 1990 | | CPI | 20H |
| E125 | CO | | | | | 2000 | | RNZ | |
| E126 | CD | 2F | E1 | | | 2010 | PLOOP | CALL | ESCAPE |
| E129 | FE | 20 | | | | 2020 | | CPI | 20H |
| E12B | C2 | 26 | E1 | | | 2030 | | JNZ | PLOOP |
| E12E | C9 | | | | | 2040 | | RET | |
| E12F | | | | | | 2050 | * | | |
| E12F | CD | 30 | E1 | | | 2060 | ESCAPE | CALL | KEYSTAT |
| E132 | C8 | | | | | 2070 | | RZ | |
| E133 | CD | 41 | E1 | | | 2080 | | CALL | CONVERT |
| E136 | FE | 1B | | | | 2090 | | CPI | 1BH ;ESCAPE |
| E138 | CA | 52 | E0 | | | 2100 | | JZ | START |
| E13B | C9 | | | | | 2110 | | RET | |
| E13C | | | | | | 2120 | * | | |
| E13C | DB | 00 | | | | 2130 | KEYSTAT | IN | CONS |
| E13E | E6 | 40 | | | | 2140 | | ANI | RDA |

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opnd | Operand |
|------|------|----|----|----|---|------|---|------------------------|-------------------|
| E140 | C9 | | | | | 2150 | | RET | |
| E141 | | | | | | 2160 | * | | |
| E141 | | | | | | 2170 | * KEYBOARD CODE CONVERSION | | |
| E141 | DB | 01 | | | | 2180 | CONVERT | IN COND | ;KEYBOARD DATA |
| E143 | E5 | | | | | 2190 | | PUSH H | |
| E144 | C5 | | | | | 2200 | | PUSH B | |
| E145 | 01 | 05 | 00 | | | 2210 | | LXI B, TABLEND-KTABL/2 | |
| E148 | 21 | 5B | E1 | | | 2220 | | LXI H, KTABL | |
| E148 | ED | A1 | | | | 2230 | LOOP | CCI | ;COMPARE TABLE |
| E14D | 28 | 06 | | | | 2240 | | JRZ FND | |
| E14F | 23 | | | | | 2250 | | INX H | |
| E150 | EA | 4B | E1 | | | 2260 | | JPE LOOP | ;CONT LOOKING |
| E153 | 18 | 01 | | | | 2270 | | JR NFND | |
| E155 | 7E | | | | | 2280 | FND | MOV A, M | ;NEW CODE |
| E156 | E6 | 7F | | | | 2290 | NFND | ANI 7FH | ;MASK DOWN |
| E158 | C1 | | | | | 2300 | | POP B | |
| E159 | E1 | | | | | 2310 | | POP H | |
| E15A | C9 | | | | | 2320 | | RET | |
| E15B | | | | | | 2330 | * | | |
| E15B | | | | | | 2340 | * THIS TABLE CAN BE EXTENDED IF DESIRED | | |
| E15B | E1 | 5D | | | | 2350 | KTABL | DD 0E15DH | ;] |
| E15D | F1 | 5B | | | | 2360 | | DD 0F15BH | ;L |
| E15F | A1 | 7E | | | | 2370 | | DD 0A17EH | ;~ |
| E161 | B1 | 5C | | | | 2380 | | DD 0B15CH | ;\ ; |
| E163 | 60 | 15 | | | | 2390 | | DD 06015H | ;CURSOR UP |
| E165 | E165 | = | | | | 2400 | TABLEND | EQU \$ | |
| E165 | | | | | | 2410 | | ORG KTABL+30 | ;ROOM FOR 15 CONV |
| E179 | | | | | | 2420 | * | | |
| E179 | | | | | | 2430 | * CHECKSUM ROUTINE | | |
| E179 | CD | D1 | E4 | | | 2440 | CHKSM | CALL PTSTNG | |
| E17C | 43 | 48 | 45 | 43 | | 2450 | | DTH 'CHECKSUM' | |
| E180 | 4B | 53 | 55 | 4D | | | | | |
| E184 | A0 | | | | | | | | |
| E185 | CD | 0E | E1 | | | 2460 | | CALL TAHEX | |
| E188 | 06 | 00 | | | | 2470 | | MVI B, 0 | |
| E18A | 7E | | | | | 2480 | CHKSMLP | MOV A, M | |
| E18B | 80 | | | | | 2490 | | ADD B | |
| E18C | 47 | | | | | 2500 | | MOV B, A | |
| E18D | CD | 3F | E2 | | | 2510 | | CALL BMP | |
| E190 | 20 | F8 | | | | 2520 | | JRNZ CHKSMLP | |
| E192 | 73 | | | | | 2530 | | MOV A, B | |
| E193 | C3 | 26 | E2 | | | 2540 | | JMP PT2 | |
| E196 | | | | | | 2550 | * | | |
| E196 | | | | | | 2560 | * WARM START | | |
| E196 | | | | | | 2570 | * | | |
| E196 | CD | D1 | E4 | | | 2580 | WARM | CALL PTSTNG | |
| E199 | 4A | 55 | 4D | 50 | | 2590 | | DTH 'JUMP TO DOS' | |
| E19D | 20 | 54 | 4F | 20 | | | | | |
| E1A1 | 44 | 4F | D3 | | | | | | |
| E1A4 | 21 | E7 | 04 | | | 2600 | | LXI H, 04E7H | ;MDOS RESTART |
| E1A7 | 7E | | | | | 2610 | | MOV A, M | |
| E1A8 | FE | C3 | | | | 2620 | | CPI 0C3H | |
| E1AA | C2 | 00 | 00 | | | 2630 | | JNZ 0 | ;CP/M RESTART |
| E1AD | E9 | | | | | 2640 | | PCHL | ;MDOS WARM START |
| E1AE | | | | | | 2650 | * | | |
| E1AE | | | | | | 2660 | * KEYBOARD ECHO ROUTINE | | |

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opnd | Operand |
|------|----|----|----|----|------|---|------|--------------------|
| E1AE | CD | D1 | E4 | | 2670 | ECHO | CALL | PTSTNG |
| E1B1 | 45 | 43 | 48 | 4F | 2680 | | DTH | 'ECHO KEYS ' |
| E1B5 | 20 | 4B | 45 | 59 | | | | |
| E1B9 | 53 | A0 | | | | | | |
| E1BB | CD | 2F | E1 | | 2690 | ECOLP | CALL | ESCAPE |
| E1BE | C4 | DC | E0 | | 2700 | | CNZ | PTCN |
| E1C1 | 13 | F8 | | | 2710 | | JR | ECOLP |
| E1C3 | | | | | 2720 | * | | ;LOOK AT KEYBOARD |
| E1C3 | | | | | 2730 | *** MEMORY TEST ROUTINE *** | | ;PRINT IF KEYPRES. |
| E1C3 | | | | | 2740 | * | | ;CONTINUE LOOPING |
| E1C3 | CD | D1 | E4 | | 2750 | TMEM | CALL | PTSTNG |
| E1C6 | 54 | 45 | 53 | 54 | 2760 | | DTH | 'TEST ' |
| E1CA | A0 | | | | | | | |
| E1CB | CD | 0E | E1 | | 2770 | | CALL | TAHEX |
| E1CE | 01 | 5A | 5A | | 2780 | | LXI | B,5A5AH |
| E1D1 | CD | FD | E1 | | 2790 | CYCL | CALL | RNDM |
| E1D4 | C5 | | | | 2800 | | PUSH | B |
| E1D5 | E5 | | | | 2810 | | PUSH | H |
| E1D6 | D5 | | | | 2820 | | PUSH | D |
| E1D7 | CD | FD | E1 | | 2830 | TLOP | CALL | RNDM |
| E1DA | 70 | | | | 2840 | | MOV | M, B |
| E1DB | CD | 3F | E2 | | 2850 | | CALL | BMP |
| E1DE | C2 | D7 | E1 | | 2860 | | JNZ | TLOP |
| E1E1 | D1 | | | | 2870 | | POP | D |
| E1E2 | E1 | | | | 2880 | | POP | H |
| E1E3 | C1 | | | | 2890 | | POP | B |
| E1E4 | E5 | | | | 2900 | | PUSH | H |
| E1E5 | D5 | | | | 2910 | | PUSH | D |
| E1E6 | CD | FD | E1 | | 2920 | RLOP | CALL | RNDM |
| E1E9 | 7E | | | | 2930 | | MOV | A, M |
| E1EA | B8 | | | | 2940 | | CMP | B |
| E1EB | C4 | 1D | E2 | | 2950 | | CNZ | ERR |
| E1EE | CD | 3F | E2 | | 2960 | | CALL | BMP |
| E1F1 | C2 | E6 | E1 | | 2970 | | JNZ | RLOP |
| E1F4 | D1 | | | | 2980 | | POP | D |
| E1F5 | E1 | | | | 2990 | | POP | H |
| E1F6 | 3E | 2E | | | 3000 | | HVI | A, . |
| E1F8 | CD | 8A | E3 | | 3010 | | CALL | VIDEO |
| E1FB | 18 | D4 | | | 3020 | | JR | CYCL |
| E1FD | | | | | 3030 | *** THIS ROUTINE GENERATES RANDOM NOS *** | | |
| E1FD | CD | 20 | E1 | | 3040 | RNDM | CALL | PAUSE |
| E200 | 73 | | | | 3050 | | MOV | A, B |
| E201 | E6 | B4 | | | 3060 | | ANI | 084H |
| E203 | A7 | | | | 3070 | | ANA | A |
| E204 | EA | 08 | E2 | | 3080 | | JPE | PEVE |
| E207 | 37 | | | | 3090 | | STC | |
| E208 | 79 | | | | 3100 | PEVE | MOV | A, C |
| E209 | 17 | | | | 3110 | | RAL | |
| E20A | 4F | | | | 3120 | | MOV | C, A |
| E20B | 78 | | | | 3130 | | MOV | A, B |
| E20C | 17 | | | | 3140 | | RAL | |
| E20D | 47 | | | | 3150 | | MOV | B, A |
| E20E | C9 | | | | 3160 | | RET | |
| E20F | | | | | 3170 | * | | |
| E20F | | | | | 3180 | *** ERROR PRINT OUT ROUTINE | | |
| E20F | | | | | 3190 | * | | |

Extended Systems Monitor User's Manual

Page 7

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opcd | Operand | |
|------|----|----|----|----|---|--|------|-------------|-------------------|
| E20F | CD | DF | E0 | | | 3200 PTAD | CALL | CRLF | ;PRINT CR,LF |
| E212 | CD | 20 | E1 | | | 3210 | CALL | PAUSE | |
| E215 | 7C | | | | | 3220 | MOV | A,H | ;PRINT |
| E216 | CD | 26 | E2 | | | 3230 | CALL | PT2 | ;ASCII |
| E219 | 7D | | | | | 3240 | MOV | A,L | ;CODES |
| E21A | C3 | 2F | E7 | | | 3250 | JMP | PT2S | ;FOR ADDRESS |
| E21D | | | | * | | 3260 * | | | |
| E21D | F5 | | | | | 3270 ERR | PUSH | PSW | ;SAVE ACC |
| E21E | CD | 0F | E2 | | | 3280 | CALL | PTAD | ;PRINT ADD. |
| E221 | 78 | | | | | 3290 | MOV | A,B | ;DATA |
| E222 | CD | 2F | E7 | | | 3300 | CALL | PT2S | ;WRITTEN |
| E225 | F1 | | | | | 3310 | POP | PSW | ;DATA READ |
| E226 | F5 | | | | | 3320 PT2 | PUSH | PSW | |
| E227 | CD | 2D | E2 | | | 3330 | CALL | BINH | |
| E22A | F1 | | | | | 3340 | POP | PSW | |
| E22B | 18 | 04 | | | | 3350 | JR | BINL | |
| E22D | 1F | | | | | 3360 BINH | RAR | | ;SHIFT RHT 4 BITS |
| E22E | 1F | | | | | 3370 | RAR | | |
| E22F | 1F | | | | | 3380 | RAR | | |
| E230 | 1F | | | | | 3390 | RAR | | |
| E231 | E6 | 0F | | | | 3400 BINL | ANI | 0FH | |
| E233 | C6 | 30 | | | | 3410 | ADI | 48 | ;LOW 4 BITS |
| E235 | FE | 3A | | | | 3420 | CPI | 58 | ;ASCII BIAS |
| E237 | DA | DC | E0 | | | 3430 | JC | PTCN | |
| E23A | C6 | 07 | | | | 3440 | ADI | 7 | ;DIGIT 0-9 |
| E23C | C3 | DC | E0 | | | 3450 | JMP | PTCN | |
| E23F | | | | * | | 3460 * | | | |
| E23F | 7B | | | | | 3470 * COMPARE ADDRESSES AND INCREMENT H | | | |
| E240 | 95 | | | | | 3480 BMP | MOV | A,E | |
| E241 | 20 | 02 | | | | 3490 | SUB | L | |
| E243 | 7A | | | | | 3500 | JRNZ | GOON | |
| E244 | 9C | | | | | 3510 | MOV | A,D | |
| E245 | 23 | | | | | 3520 | SBB | H | |
| E246 | C9 | | | | | 3530 GOON | INX | H | |
| E246 | | | | | | 3540 | RET | | |
| E247 | | | | * | | 3550 * | | | |
| E247 | | | | | | 3560 * DISK BOOTSTRAP | | | |
| E247 | CD | D1 | E4 | | | 3570 BOOT | CALL | PTSTNG | |
| E24A | 42 | 4F | 4F | 54 | | 3580 | DTH | 'BOOT DISK' | |
| E24E | 20 | 44 | 49 | 53 | | | | | |
| E252 | CB | | | | | | | | |
| E253 | C3 | 00 | F8 | | | 3590 | JMP | PR+1800H | |
| E253 | | | | * | | 3600 * | | | |
| E256 | | | | | | 3610 * JUMP TO USER RAM | | | |
| E256 | CD | D1 | E4 | | | 3620 USER | CALL | PTSTNG | |
| E259 | 55 | 53 | 45 | 52 | | 3630 | DTH | 'USER AREA' | |
| E25D | 20 | 41 | 52 | 45 | | | | | |
| E261 | C1 | | | | | | | | |
| E262 | C3 | 00 | 2B | | | 3640 | JMP | 2B00H | |
| E265 | | | | * | | 3650 * | | | |
| E265 | | | | | | 3660 * JUMP TO RAM AT PR+1C00 | | | |
| E265 | CD | D1 | E4 | | | 3670 RAM | CALL | PTSTNG | |
| E268 | 43 | 49 | 20 | 52 | | 3680 | DTH | 'HI RAM' | |
| E26C | 41 | CD | | | | | | | |
| E26E | C3 | 00 | FC | | | 3690 | JMP | PR+1C00H | |
| E271 | | | | * | | 3691 * | | | |

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opcd | Operand | |
|------|----|----|----|----|---|--|------|-------------|--------------------|
| E271 | | | | | | 3692 * JUMP TO RAM AT 0 | | | |
| E271 | CD | D1 | E4 | | | 3693 LORAM | CALL | PTSTNG | |
| E274 | 4C | 4F | 20 | 52 | | 3694 | DTH | 'LO RAM' | |
| E278 | 41 | CD | | | | | | | |
| E27A | C3 | 00 | 00 | | | 3695 | JMP | 0 | |
| E27D | | | | | | 3700 * | | | |
| E27D | | | | | | 3710 * ZERO OR FILL MEMORY WITH A CONSTANT | | | |
| E27D | CD | D1 | E4 | | | 3720 ZEROM | CALL | PTSTNG | |
| E280 | 46 | 49 | 4C | 4C | | 3730 | DTH | 'FILL ' | |
| E284 | A0 | | | | | | | | |
| E285 | CD | 0E | E1 | | | 3740 | CALL | TAHEX | ;READ ADDRESSES |
| E288 | E5 | | | | | 3750 | PUSH | H | ;SAVE H |
| E289 | CD | 0A | E1 | | | 3760 | CALL | AHE2 | ;READ 2 DIGITS |
| E28C | EB | | | | | 3770 | XCHG | | |
| E28D | E3 | | | | | 3780 | XTHL | | ;RESTORE H,L |
| E28E | C1 | | | | | 3790 | POP | B | |
| E28F | 71 | | | | | 3800 ZLOOP | MOV | M,C | ;WRITE INTO MEM |
| E290 | CD | 3F | E2 | | | 3810 | CALL | BMP | ;COMP ADD, INCR H |
| E293 | C8 | | | | | 3820 | RZ | | ;RETURN IF DONE |
| E294 | 18 | F9 | | | | 3830 | JR | ZLOOP | ;CONTINUE TIL DONE |
| E296 | | | | | | 3840 * EXCHANGE OR MOVE A BLOCK OF MEMORY | | | |
| E296 | 47 | | | | | 3850 EXCHG | MOV | B,A | |
| E297 | CD | D1 | E4 | | | 3860 | CALL | PTSTNG | |
| E29A | 45 | 58 | 43 | 48 | | 3870 | DTH | 'EXCHANGE ' | |
| E29E | 41 | 4E | 47 | 45 | | | | | |
| E2A2 | A0 | | | | | | | | |
| E2A3 | 18 | 09 | | | | 3880 | JR | MOVENTR | |
| E2A5 | 47 | | | | | 3890 MOVEB | MOV | B,A | ;SAVE CODE |
| E2A6 | CD | D1 | E4 | | | 3900 | CALL | PTSTNG | |
| E2A9 | 4D | 4F | 56 | 45 | | 3910 | DTH | 'MOVE ' | |
| E2AD | A0 | | | | | | | | |
| E2AE | CD | 0E | E1 | | | 3920 MOVENTR | CALL | TAHEX | ;READ ADDRESSES |
| E2B1 | E5 | | | | | 3930 | PUSH | H | |
| E2B2 | CD | BD | E0 | | | 3940 | CALL | AHEX | |
| E2B5 | BB | | | | | 3950 | XCHG | | |
| E2B6 | E3 | | | | | 3960 | XTHL | | ;BACK TO NORMAL |
| E2B7 | 4E | | | | | 3970 MLOOP | MOV | C,M | |
| E2B8 | E3 | | | | | 3980 | XTHL | | |
| E2B9 | 73 | | | | | 3990 | MOV | A,B | |
| E2BA | FF | 4D | | | | 4000 | CPI | 'M' | |
| E2BC | 28 | 04 | | | | 4010 | JRZ | NEXCH | |
| E2BE | 7E | | | | | 4020 | MOV | A,H | |
| E2BF | E3 | | | | | 4030 | XTHL | | |
| E2C0 | 77 | | | | | 4040 | MOV | H,A | |
| E2C1 | E3 | | | | | 4050 | XTHL | | |
| E2C2 | 71 | | | | | 4060 NEXCH | MOV | M,C | |
| E2C3 | 23 | | | | | 4070 | INX | H | |
| E2C4 | E3 | | | | | 4080 | XTHL | | |
| E2C5 | CD | 3F | E2 | | | 4090 | CALL | BMP | |
| E2C8 | CA | 52 | E0 | | | 4100 | JZ | START | |
| E2CB | 18 | EA | | | | 4110 | JR | MLOOP | |
| E2CD | | | | | | 4120 * NON DESTRUCTIVE MEMORY TEST | | | |
| E2CD | CD | D1 | E4 | | | 4130 NDMT | CALL | PTSTNG | |
| E2D0 | 4D | 45 | 4D | 20 | | 4140 | DTH | 'MEM CHECK' | |
| E2D4 | 43 | 43 | 45 | 43 | | | | | |
| E2D3 | CB | | | | | | | | |

Extended Systems Monitor User's Manual

Page 9

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opnd | Operand | |
|------|----|----|----|----|---|------|-----------------------|-------|------------|----------------|
| E2D9 | 21 | 00 | 00 | | | 4150 | | LXI | H,0 | ;START AT ZERO |
| E2DC | 4E | | | | | 4160 | NDLOP | MOV | C,M | |
| E2DD | 06 | FF | | | | 4170 | | MVI | B,0FFH | |
| E2DF | 70 | | | | | 4180 | | MOV | M,B | |
| E2E0 | 7E | | | | | 4190 | | MOV | A,M | |
| E2E1 | B8 | | | | | 4200 | | CMP | B | |
| E2E2 | C2 | EA | E2 | | | 4210 | | JNZ | ERRJP | ;PRINT ERROR |
| E2E5 | 06 | 00 | | | | 4220 | | MVI | B,0 | |
| E2E7 | 70 | | | | | 4230 | | MOV | M,B | |
| E2E8 | 7E | | | | | 4240 | | MOV | A,M | |
| E2E9 | B8 | | | | | 4250 | | CMP | B | |
| E2EA | C2 | 1D | E2 | | | 4260 | ERRJP | JNZ | ERR | |
| E2ED | 71 | | | | | 4270 | | MOV | M,C | |
| E2EE | 23 | | | | | 4280 | | INX | H | |
| E2EF | 18 | EB | | | | 4290 | | JR | NDLOP | |
| E2F1 | | | | | | 4300 | * COMPARE TWO BLOCKS | OF | MEMORY | |
| E2F1 | CD | D1 | E4 | | | 4310 | COMPR | CALL | PTSTNG | |
| E2F4 | 43 | 4F | 4D | 50 | | 4320 | | DTH | 'COMPARE' | |
| E2F8 | 41 | 52 | 45 | A0 | | | | | | |
| E2FC | CD | 0E | E1 | | | 4330 | | CALL | TAHEX | |
| E2FF | E5 | | | | | 4340 | | PUSH | H | |
| E300 | CD | BD | E0 | | | 4350 | | CALL | AHEX | |
| E303 | EB | | | | | 4360 | | XCHG | | |
| E304 | 7E | | | | | 4370 | VMLOP | MOV | A,M | |
| E305 | 23 | | | | | 4380 | | INX | H | |
| E306 | E3 | | | | | 4390 | | XTHL | | |
| E307 | 3E | | | | | 4400 | | CMP | M | |
| E308 | 46 | | | | | 4410 | | MOV | B,M | |
| E309 | C4 | 1D | E2 | | | 4420 | | CNZ | ERR | |
| E30C | CD | 3F | E2 | | | 4430 | | CALL | BMP | |
| E30F | E3 | | | | | 4440 | | XTHL | | |
| E310 | 20 | F2 | | | | 4450 | | JRNZ | VMLOP | |
| E312 | F1 | | | | | 4460 | | POP | PSW | |
| E313 | C9 | | | | | 4470 | | RET | | |
| E314 | | | | | | 4480 | * SEARCH FOR SPECIFIC | CODES | | |
| E314 | F5 | | | | | 4490 | FIND | PUSH | PSW | |
| E315 | CD | D1 | E4 | | | 4500 | | CALL | PTSTNG | |
| E318 | 46 | 49 | 4E | 44 | | 4510 | | DTH | 'FIND-2' | |
| E31C | 2D | 32 | A0 | | | | | | | |
| E31F | 13 | 0D | | | | 4520 | | JR | SRCHENT | |
| E321 | F5 | | | | | 4530 | SRCH | PUSH | PSW | |
| E322 | CD | D1 | E4 | | | 4540 | | CALL | PTSTNG | |
| E325 | 53 | 45 | 41 | 52 | | 4550 | | DTH | 'SEARCH-1' | |
| E329 | 43 | 48 | 2D | 31 | | | | | | |
| E32D | A0 | | | | | | | | | |
| E32E | CD | 0E | E1 | | | 4560 | SRCHENT | CALL | TAHEX | |
| E331 | E5 | | | | | 4570 | | PUSH | H | ;SAVE H |
| E332 | CD | 0A | E1 | | | 4580 | | CALL | AHE2 | ;READ 2 DIGITS |
| E335 | E3 | | | | | 4590 | | XCHG | | ;H=CODE, D=F |
| E336 | 45 | | | | | 4600 | | MOV | B,L | ;PUT CODE IN B |
| E337 | E1 | | | | | 4610 | | POP | H | ;RESTORE H |
| E338 | F1 | | | | | 4620 | | POP | PSW | |
| E339 | FE | 53 | | | | 4630 | | CPI | 'S' | |
| E33B | F5 | | | | | 4640 | | PUSH | PSW | |
| E33C | 28 | 07 | | | | 4650 | | JRZ | CONT | |
| E33E | E5 | | | | | 4660 | | PUSH | H | |

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opcd | Operand | |
|------|----|----|----|----|---|------------|-------|------------------------|------------------|
| E33F | CD | 0A | E1 | | | 4670 | CALL | AHE2 | ;READ 2 DIGITS |
| E342 | EB | | | | | 4680 | XCHG | | |
| E343 | 4D | | | | | 4690 | MOV | C,L | |
| E344 | E1 | | | | | 4700 | POP | H | |
| E345 | 7E | | | | | 4710 | CONT | MOV A,M | ;READ MEMORY |
| E346 | B8 | | | | | 4720 | CMP | B | ;COMPARE TO CODE |
| E347 | 20 | 12 | | | | 4730 | JRNZ | SKP | ;SKIP IF NO COMP |
| E349 | F1 | | | | | 4740 | POP | PSW | ;FETCH CONTROL |
| E34A | FE | 53 | | | | 4750 | CPI | 'S' | |
| E34C | F5 | | | | | 4760 | PUSH | PSW | |
| E34D | 28 | 06 | | | | 4770 | JRZ | OBCP | |
| E34F | 23 | | | | | 4780 | INX | H | |
| E350 | 7E | | | | | 4790 | MOV | A,M | |
| E351 | 2B | | | | | 4800 | DCX | H | |
| E352 | B9 | | | | | 4810 | CMP | C | |
| E353 | 20 | 06 | | | | 4820 | JRNZ | SKP | |
| E355 | 23 | | | | | 4830 | OBCP | INX | H |
| E356 | 7E | | | | | 4840 | MOV | A,M | ;READ NEXT BYTE |
| E357 | 2B | | | | | 4850 | DCX | H | ;DECR ADDRESS |
| E358 | CD | 1D | E2 | | | 4860 | CALL | ERR | ;PRINT CODES |
| E35B | CD | 3F | E2 | | | 4870 | SKP | CALL | BMP |
| E35E | 20 | E5 | | | | 4880 | JRNZ | CONT | ;CHECK IF DONE |
| E360 | F1 | | | | | 4890 | POP | PSW | ;BACK FOR MORE |
| E361 | C9 | | | | | 4900 | RET | | |
| E362 | | | | | | 4910 | * | | |
| E362 | | | | | | 4920 | * | INPUT DATA FROM A PORT | |
| E362 | CD | D1 | E4 | | | 4930 | PINPT | CALL | PTSTNG |
| E365 | 49 | 4E | 50 | 55 | | 4940 | | DTH | 'INPUT' |
| E369 | 54 | A0 | | | | | | | |
| E36B | CD | 0A | E1 | | | 4950 | CALL | AHE2 | ;READ 2 DIGITS |
| E36E | 4B | | | | | 4960 | MOV | C,E | |
| E36F | ED | 78 | | | | 4970 | INP | A | |
| E371 | C3 | 26 | E2 | | | 4980 | JMP | PT2 | |
| E374 | | | | | | 4990 | * | | |
| E374 | | | | | | 5000 | * | OUTPUT TO A PORT | |
| E374 | CD | D1 | E4 | | | 5010 | POUTP | CALL | PTSTNG |
| E377 | 4F | 55 | 54 | 50 | | 5020 | | DTH | 'OUTPUT' |
| E378 | 55 | 54 | A0 | | | | | | |
| E37E | CD | 0A | E1 | | | 5030 | CALL | AHE2 | ;READ 2 DIGITS |
| E381 | CD | 0A | E1 | | | 5040 | CALL | AHE2 | ;READ 2 DIGITS |
| E384 | 4D | | | | | 5050 | MOV | C,L | |
| E385 | ED | 59 | | | | 5060 | OUTP | E | |
| E387 | C9 | | | | | 5070 | RET | | |
| E388 | | | | | | 5080 | * | | |

Extended Systems Monitor User's Manual

Page 11

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opcd | Operand |
|------|----------|----|----|----|---|--|------|---------------------------|
| E388 | | | | | | 5090 * | | |
| E388 | | | | | | 5100 ***** | | |
| E388 | | | | | | 5110 * | | * |
| E388 | | | | | | 5120 * VIDEO DRIVER FOR FLASHWRITER II | | * |
| E388 | | | | | | 5130 * | | * |
| E388 | | | | | | 5140 ***** | | |
| E388 | | | | | | 5145 * | | |
| E388 | F000 | = | | | | 5150 PAGE | EQU | PR+1000H ;SCREEN LOCATION |
| E388 | 0020 | = | | | | 5160 SPACE | EQU | 20H |
| E388 | 0004 | = | | | | 5170 CLRSCRN | EQU | 4 |
| E388 | | | | | | 5180 * | | |
| E388 | | | | | | 5190 * COMMANDS: | | |
| E388 | | | | | | 5200 * (B) HOME CURSOR | | |
| E388 | | | | | | 5210 * (D) CLEAR SCREEN | | |
| E388 | | | | | | 5220 * (E) PRINT CONTROL CODE | | |
| E388 | | | | | | 5230 * (H) BACKSPACE | | |
| E388 | | | | | | 5240 * (I) TAB | | |
| E388 | | | | | | 5250 * (J) LINEFEED | | |
| E388 | | | | | | 5260 * (M) CARRIAGE RETURN | | |
| E388 | | | | | | 5270 * (N) NO CURSOR | | |
| E388 | | | | | | 5280 * (P) CLEAR TO END OF SCREEN | | |
| E388 | | | | | | 5290 * (Q) CLEAR TO END OF LINE | | |
| E388 | | | | | | 5300 * (R) CURSOR DOWN | | |
| E388 | | | | | | 5310 * (T) TOGGLE REVERSE VIDEO | | |
| E388 | | | | | | 5320 * (U) CURSOR UP | | |
| E388 | | | | | | 5330 * (W) CURSOR LEFT | | |
| E388 | | | | | | 5340 * (X) CLEAR TO START OF LINE | | |
| E388 | | | | | | 5350 * (Z) CURSOR RIGHT | | |
| E388 | | | | | | 5360 * ESC XY POSITION LEAD-IN | | |
| E388 | | | | | | 5370 * | | |
| E388 | | | | | | 5380 * VIDEO BOARD PARAMETERS | | |
| E388 | 0050 | = | | | | 5390 HORIZ | EQU | 30 ;NO. OF CHARACTER |
| E388 | 0018 | = | | | | 5400 VERT | EQU | 24 ;NO. OF LINES |
| E388 | | | | | | 5410 * | | |
| E388 | 3E 14 | | | | | 5415 TVIDEO | MVI | A,'T'-64 ;TOGGLE VIDEO |
| E38A | | | | | | 5416 * | | |
| E38A | F5 | | | | | 5420 VIDEO | PUSH | PSW |
| E38B | C5 | | | | | 5430 | PUSH | B |
| E38C | D5 | | | | | 5440 | PUSH | D |
| E38D | E5 | | | | | 5450 | PUSH | H |
| E38E | B6 7F | | | | | 5460 | ANI | 07FH |
| E390 | 4F | | | | | 5470 | MOV | C,A |
| E391 | 3A 00 E8 | | | | | 5480 | LDA | BASE+800H |
| E394 | FE C3 | | | | | 5490 | CPI | 0C3H ;PROM THERE? |
| E396 | 79 | | | | | 5500 | MOV | A,C |
| E397 | CC 00 E8 | | | | | 5510 | CZ | BASE+800H ;CALL IT IF SO |
| E39A | CD 6F E4 | | | | | 5520 DISPL | CALL | LIFTCURS ;ERASE CURSOR |
| E39D | 3A EA FF | | | | | 5530 | LDA | XYFLAG |
| E3A0 | A7 | | | | | 5540 | ANA | A |
| E3A1 | 28 0A | | | | | 5550 | JRZ | NOXY |
| E3A3 | 3D | | | | | 5560 | DCR | A |
| E3A4 | 32 EA FF | | | | | 5570 | STA | XYFLAG |
| E3A7 | CA BC E4 | | | | | 5580 | JZ | YPOS |
| E3AA | C3 B3 E4 | | | | | 5590 | JMP | XPOS |
| E3AD | 79 | | | | | 5600 NOXY | MOV | A,C ;RECOVER CHARACTE. |
| E3AE | FE 20 | | | | | 5610 | CPI | SPACE ;PRINTING CODE? |

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opnd | Operand |
|------|----|----|----|----|---|------------|---|----------------------------------|
| E380 | F2 | E4 | E3 | | | 5620 | JP | PRINT |
| E3B3 | FE | 1C | | | | 5630 | CPI | PCL-TABL ;TOO LARGE? |
| E3B5 | F2 | 51 | E4 | | | 5640 | JP | RET |
| E3B8 | E5 | | | | | 5650 | PUSH | H ;CURSOR IN MEMORY |
| E3B9 | 21 | C7 | E3 | | | 5660 | LXI | H,TABL ;TABLE START |
| E3BC | 5F | | | | | 5670 | MOV | E,A |
| E3BD | 16 | 00 | | | | 5680 | MVI | D,0 |
| E3BF | 19 | | | | | 5690 | DAD | D |
| E3C0 | 5E | | | | | 5700 | MOV | E,M |
| E3C1 | 21 | E3 | E3 | | | 5710 | LXI | H,PCL |
| E3C4 | 19 | | | | | 5720 | DAD | D |
| E3C5 | E3 | | | | | 5730 | XTHL | |
| E3C6 | C9 | | | | | 5740 | RET | ;RECOVER H ;EXECUTE ROUTINE |
| E3C7 | | | | | | 5750 | * CONTROL CHARACTER JUMP TABLE | |
| E3C7 | 6E | | | | | 5760 | TABL | DB RET-PCL ;Q |
| E3C8 | 6E | | | | | 5770 | | DB RET-PCL ;A |
| E3C9 | 63 | | | | | 5780 | | DB HOME-PCL ;B HOME CURSOR |
| E3CA | 6E | | | | | 5790 | | DB RET-PCL ;C |
| E3CB | 60 | | | | | 5800 | | DB FORM-PCL ;D CLEAR SCREEN |
| E3CC | 00 | | | | | 5810 | | DB PCL-PCL ;E PRT CONTROL |
| E3CD | 6E | | | | | 5820 | | DB RET-PCL ;F |
| E3CE | 6E | | | | | 5830 | | DB RET-PCL ;G |
| E3CF | 42 | | | | | 5840 | | DB DBACKSP-PCL ;H BACKSPACE |
| E3D0 | 59 | | | | | 5850 | | DB TAB-PCL ;I TAB OVER |
| E3D1 | 12 | | | | | 5860 | | DB LINF-PCL ;J LINE FEED |
| E3D2 | 6E | | | | | 5870 | | DB RET-PCL ;K |
| E3D3 | 6E | | | | | 5880 | | DB RET-PCL ;L |
| E3D4 | 6A | | | | | 5890 | | DB CRET-PCL ;M CARRIAGE RET |
| E3D5 | 71 | | | | | 5900 | | DB RET+3-PCL ;N NO CURSOR |
| E3D6 | 6E | | | | | 5910 | | DB RET-PCL ;O |
| E3D7 | A5 | | | | | 5920 | | DB CLEND-PCL ;P CLR SCN TO END |
| E3D8 | AA | | | | | 5930 | | DB CLLINE-PCL ;Q CLR LINE TO END |
| E3D9 | 12 | | | | | 5940 | | DB LINF-PCL ;R CURSOR DOWN |
| E3DA | 6E | | | | | 5950 | | DB RET-PCL ;S |
| E3DB | 76 | | | | | 5960 | | DB TVIDF-PCL ;T TOGGLE VIDEO |
| E3DC | 80 | | | | | 5970 | | DB CURSUP-PCL ;U CURSOR UP |
| E3DD | 6E | | | | | 5980 | | DB RET-PCL ;V |
| E3DE | 50 | | | | | 5990 | | DB BACKSP-PCL ;W CURSOR LEFT |
| E3DF | E2 | | | | | 6000 | | DB CLSTRT-PCL ;X CLR START OF L |
| E3E0 | 6E | | | | | 6010 | | DB RET-PCL ;Y |
| E3E1 | 06 | | | | | 6020 | | DB EOL-PCL ;Z CURSOR RIGHT |
| E3E2 | C9 | | | | | 6030 | | DB LEDIN-PCL ;[ESC-XY LEADIN |
| E3E3 | | | | | | 6040 | * | |
| E3E3 | 48 | | | | | 6050 | * PRINT CODE IN B REGARDLESS | |
| E3E4 | | | | | | 6060 | PCL | MOV C,B |
| E3E4 | 3A | DD | FF | | | 6070 | * PRINT THE CHARACTER ON THE SCREEN | |
| E3E4 | 3A | DD | FF | | | 6080 | PRINT | LDA VFL |
| E3E7 | A9 | | | | | 6090 | | XRA C |
| E3E8 | 77 | | | | | 6100 | | MOV M,A |
| E3E9 | | | | | | 6110 | * EOL CHECKS THE CURS POS FOR END OF LINE | |
| E3E9 | 3A | DB | FF | | | 6120 | EOL | LDA CURPOS |
| E3EC | 3C | | | | | 6130 | | INR A |
| E3ED | FE | 50 | | | | 6140 | | CPI HORIZ |
| E3EF | 38 | 5D | | | | 6150 | | JRC TABRET |
| E3F1 | AF | | | | | 6160 | | XRA A |
| E3F2 | 32 | DB | FF | | | 6170 | | STA CURPOS |

Extended Systems Monitor User's Manual

Page 13

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opnd | Operand |
|------|----|----|----|----|---|--|------|----------------------|
| E3F5 | | | | | | 6180 * MOVE DN 1 LINE | | |
| E3F5 | 3A | DC | FF | | | 6190 LINF | LDA | LINENO |
| E3F3 | FE | 17 | | | | 6200 | CPI | VERT-1 |
| E3FA | 20 | 23 | | | | 6210 | JRNZ | NOSCRRL |
| E3FC | | | | | | 6220 * SCROLL UP ONE LINE | | |
| E3FC | 21 | 50 | 00 | | | 6230 SCROLL | LXI | H,HORIZ |
| E3FF | ED | 5B | DF | FF | | 6240 | LDED | TOSCN |
| E403 | 19 | | | | | 6250 | DAD | D |
| E404 | ED | A0 | | | | 6260 SCRL | LDI | |
| E406 | ED | A0 | | | | 6270 | LDI | |
| E408 | 7C | | | | | 6280 | MOV | A,H |
| E409 | FE | F7 | | | | 6290 | CPI | HORIZ*VERT+PAGE/256 |
| E40B | 20 | F7 | | | | 6300 | JRNZ | SCRL |
| E40D | 7D | | | | | 6310 | MOV | A,L |
| E40E | FE | 80 | | | | 6320 | CPI | HORIZ*VERT+PAGE&OFFH |
| E410 | 20 | F2 | | | | 6330 | JRNZ | SCRL |
| E412 | 3A | DC | FF | | | 6340 | LDA | LINENO |
| E415 | | | | | | 6350 * ERASE BOTTOM LINE | | |
| E415 | EB | | | | | 6360 EBOTL | XCHG | |
| E416 | 06 | 50 | | | | 6370 | MVI | B,HORIZ |
| E418 | 36 | 20 | | | | 6380 ELOP | MVI | M,SPACE |
| E41A | 23 | | | | | 6390 | INX | H |
| E41B | 05 | | | | | 6400 | DCR | B |
| E41C | 20 | FA | | | | 6410 | JRNZ | ELOP |
| E41E | 3D | | | | | 6420 | DCR | A |
| E41F | 3C | | | | | 6430 NOSCRRL | INR | A |
| E420 | 32 | DC | FF | | | 6440 | STA | LINENO |
| E423 | 18 | 2C | | | | 6450 | JR | RET |
| E425 | | | | | | 6460 * | | |
| E425 | 36 | 20 | | | | 6470 * ERASE BEFORE BACKSPACING | | |
| E427 | 3A | DB | FF | | | 6480 DBACKSP | MVI | M,20H |
| E42A | A7 | | | | | 6481 | LDA | CURPOS |
| E42B | 28 | 24 | | | | 6482 | ANA | A |
| E42D | 3D | | | | | 6483 | JRZ | RET |
| E42E | 2B | | | | | 6484 | DCR | A |
| E42F | 36 | 20 | | | | 6485 | DCX | H |
| E431 | 13 | 1B | | | | 6486 | MVI | M,20H |
| E433 | | | | | | 6487 | JR | TABRET |
| E433 | 3A | DB | FF | | | 6510 * MOVE THE CURSOR BACK | | |
| E436 | 3D | | | | | 6520 BACKSP | LDA | CURPOS |
| E437 | F2 | 4E | E4 | | | 6530 | DCR | A |
| E43A | 18 | 11 | | | | 6540 | JP | TABRET |
| E43C | 3A | DB | FF | | | 6550 | JR | CRET |
| E43F | F6 | 07 | | | | 6560 * TAB OVER TO THE NEXT 3 MULTIPLE | | |
| E441 | 18 | A9 | | | | 6570 TAB | LDA | CURPOS |
| E443 | CD | 9A | E4 | | | 6580 | ORI | 7 |
| E446 | AF | | | | | 6590 | JR | EOL+3 |
| E447 | 32 | DC | FF | | | 6600 * CLEAR THE SCREEN AND HOME UP | | |
| E44A | 32 | DD | FF | | | 6610 FORM | CALL | CLEAR |
| E44D | AF | | | | | 6620 HOME | XRA | A |
| E44E | 32 | DB | FF | | | 6630 | STA | LINENO |
| E451 | | | | | | 6640 | STA | VFL |
| | | | | | | 6650 * CARRIAGE RETURN | | ;CLR VID FLAG |
| | | | | | | 6660 CRET | XRA | A |
| | | | | | | 6670 TABRET | STA | CURPOS |
| | | | | | | 6680 * RETURN TO THE CALLING ROUTINE | | |

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Opcd | Operand |
|------|----|----|----|----|---|--|------|---------------|
| E451 | CD | 6F | E4 | | | 6690 RET | CALL | LIFTCURS |
| E454 | E1 | | | | | 6700 | POP | H |
| E455 | D1 | | | | | 6710 | POP | D |
| E456 | C1 | | | | | 6720 | POP | B |
| E457 | F1 | | | | | 6730 | POP | PSW |
| E458 | C9 | | | | | 6740 | RET | |
| E459 | 3A | DD | FF | | | 6750 TVIDF | LDA | VFL |
| E45C | EE | 80 | | | | 6760 | XRI | 80H |
| E45E | 32 | DD | FF | | | 6770 | STA | VFL |
| E461 | 18 | EE | | | | 6780 | JR, | RET |
| E463 | | | | | | 6790 * | | |
| E463 | | | | | | 6800 * MOVE THE CURSOR UP | | |
| E463 | 3A | DC | FF | | | 6810 CURSUP | LDA | LINENO |
| E466 | A7 | | | | | 6820 | ANA | A |
| E467 | 28 | E8 | | | | 6830 | JRZ | RET |
| E469 | 3D | | | | | 6840 | DCR | A |
| E46A | 32 | DC | FF | | | 6850 STORLN | STA | LINENO |
| E46D | 18 | E2 | | | | 6860 | JR | RET |
| E46F | | | | | | 6870 * CALCULATE MEM ADD FROM CURS POS | | |
| E46F | 21 | B0 | EF | | | 6880 LIFTCURS | LXI | H,PAGE-HORIZ |
| E472 | 11 | 50 | 00 | | | 6890 | LXI | D,HORIZ |
| E475 | 3A | DC | FF | | | 6900 | LDA | LINENO |
| E478 | 3C | | | | | 6910 | INR | A |
| E479 | 19 | | | | | 6920 CLOP | DAD | D |
| E47A | 3D | | | | | 6930 | DCR | A |
| E47B | 20 | FC | | | | 6940 | JRNZ | CLOP |
| E47D | ED | 5B | DB | FF | | 6950 CFIN | LDED | CURPOS |
| E481 | 57 | | | | | 6960 | MOV | D,A |
| E482 | 19 | | | | | 6970 | DAD | D |
| E483 | | | | | | 6980 * REVERSE THE VIDEO | | |
| E483 | 7E | | | | | 6990 | MOV | A,M |
| E484 | EE | 30 | | | | 7000 | XRI | 80H |
| E486 | 77 | | | | | 7010 | MOV | M,A |
| E487 | C9 | | | | | 7020 | RET | |
| E488 | | | | | | 7030 * CLEAR TO END OF SCREEN | | |
| E488 | CD | A3 | E4 | | | 7040 CLEND | CALL | WRSPC |
| E488 | 18 | C4 | | | | 7050 | JR | RET |
| E48D | | | | | | 7060 * CLEAR TO END OF LINE | | |
| E48D | 3A | D3 | FF | | | 7070 CLLINE | LDA | CURPOS |
| E490 | 36 | 20 | | | | 7080 | MVI | M,20H |
| E492 | 23 | | | | | 7090 | INX | H |
| E493 | 3C | | | | | 7100 | INR | A |
| E494 | FE | 50 | | | | 7110 | CPI | 50H |
| E496 | 20 | F8 | | | | 7120 | JRNZ | CLLINE+3 |
| E493 | 18 | B7 | | | | 7130 | JR | RET |
| E49A | | | | | | 7140 * CLEAR THE SCREEN | | |
| E49A | 21 | 00 | F0 | | | 7150 CLEAR | LXI | H,PAGE |
| E49D | 22 | DF | FF | | | 7160 | SHLD | TOSCN |
| E4A0 | 22 | EA | FF | | | 7170 | SHLD | XYFLAG |
| E4A3 | 36 | 20 | | | | 7180 WRSPC | MVI | H,20H |
| E4A5 | 23 | | | | | 7190 | INX | H |
| E4A6 | 7C | | | | | 7200 | MOV | A,H |
| E4A7 | FE | F3 | | | | 7210 | CPI | PAGE+2048/256 |
| E4A9 | 20 | F8 | | | | 7220 | JRNZ | WRSPC |
| E4AB | C9 | | | | | 7230 | RET | |
| E4AC | | | | | | 7240 * | | |

Extended Systems Monitor User's Manual

Page 15

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opcd | Operand | |
|------|------|----|----|----|---|------|--------------------------------|------|-------------|-------------------|
| E4AC | | | | | | 7250 | * PROCESS LEAD IN CODE | | | |
| E4AC | 3E | 02 | | | | 7260 | LEPIN | MVI | A,2 | |
| E4AE | 32 | EA | FF | | | 7270 | | STA | XYFLAG | |
| E4B1 | 18 | 9E | | | | 7230 | | JR | RET | |
| E4B3 | | | | | | 7290 | * | | | |
| E4B3 | | | | | | 7300 | * SET X AND Y CURSOR POSITIONS | | | |
| E4B3 | 79 | | | | | 7310 | XPOS | MOV | A,C | |
| E4B4 | FE | 50 | | | | 7320 | | CPI | 80 | |
| E4B6 | 38 | 02 | | | | 7330 | | JRC | XINRG | |
| E4B8 | 3E | 4F | | | | 7340 | | MVI | A,79 | |
| E4BA | 18 | 92 | | | | 7350 | XINRG | JR | TABRET | |
| E4BC | | | | | | 7360 | * | | | |
| E4BC | 79 | | | | | 7370 | YPOS | MOV | A,C | |
| E4BD | FE | 18 | | | | 7380 | | CPI | 24 | |
| E4BF | 38 | 02 | | | | 7390 | | JRC | YINRG | |
| E4C1 | 3E | 17 | | | | 7400 | | MVI | A,23 | |
| E4C3 | 18 | A5 | | | | 7410 | YINRG | JR | STORLN | |
| E4C5 | | | | | | 7420 | * | | | |
| E4C5 | AF | | | | | 7430 | CLSTRT | XRA | A | |
| E4C6 | 32 | DB | FF | | | 7440 | | STA | CURPOS | |
| E4C9 | CD | 6F | E4 | | | 7450 | | CALL | LIFTCURS | |
| E4CC | 18 | BF | | | | 7460 | | JR | CLLINE | |
| E4CE | E4CE | = | | | | 7470 | MSEND | EQU | \$ | |
| E4CE | | | | | | 7480 | * CURSOR STORAGE LOCATIONS | | | |
| E4CE | | | | | | 7490 | | ORG | SPTR+08H | |
| FFDB | 00 | | | | | 7500 | CURPOS | DB | 0 | ;POS ON LINE |
| FFDC | 00 | | | | | 7510 | LINENO | DB | 0 | ;LINE NUMBER |
| FFDD | 00 | | | | | 7520 | VFL | DB | 0 | ;REVERSE VID FLAG |
| FFDE | 00 | | | | | 7530 | WIDTH | DB | 0 | ;PRINT WIDTH |
| FFDF | 00 | F0 | | | | 7540 | TOSCN | DW | PAGE | ;TOP OF SCREEN |
| FFE1 | 00 | 00 | | | | 7550 | TCURPOS | DW | 0 | ;TEMP POSITION |
| FFE3 | | | | | | 0030 | | LINK | 'M5' | |
| FFE3 | | | | | | 0000 | * ADDITIONS TO 4.0 MONITOR | | | |
| FFE3 | | | | | | 0010 | | ORG | MSEND | |
| E4CE | | | | | | 0020 | * PRINT A STRING | | | |
| E4CE | CD | DF | E0 | | | 0021 | RPTSTNG | CALL | CRLF | ;CRLF FIRST |
| E4D1 | E3 | | | | | 0030 | PTSTNG | XTHL | | |
| E4D2 | 7E | | | | | 0040 | | MOV | A,M | |
| E4D3 | 23 | | | | | 0050 | | INX | H | |
| E4D4 | E3 | | | | | 0060 | | XTHL | | |
| E4D5 | A7 | | | | | 0070 | | ANA | A | |
| E4D6 | CD | 8A | E3 | | | 0080 | | CALL | VIDEO | ;PRINT IT |
| E4D9 | F8 | | | | | 0090 | | RM | | |
| E4DA | 18 | F5 | | | | 0100 | | JR | PTSTNG | |
| E4DC | | | | | | 0110 | * SIGN ON MESSAGE | | | |
| E4DC | 3E | 04 | | | | 0120 | SIGN | MVI | A,4 | ;CLEAR SCREEN |
| E4DE | CD | 8A | E3 | | | 0125 | | CALL | VIDEO | |
| E4E1 | 21 | 50 | F1 | | | 0130 | | LXI | H,PAGE+150H | |
| E4E4 | E5 | | | | | 0140 | | PUSH | H | |
| E4E5 | 11 | 51 | F1 | | | 0150 | | LXI | D,PAGE+151H | |
| E4E8 | 01 | 30 | 00 | | | 0160 | | LXI | B,30H | |
| E4EB | 36 | A0 | | | | 0170 | | MVI | H,0A0H | |
| E4ED | ED | B0 | | | | 0180 | | LDIR | | |
| E4EF | E1 | | | | | 0190 | | POP | H | |
| E4F0 | 11 | A0 | F1 | | | 0200 | | LXI | D,PAGE+1A0H | |
| E4F3 | 01 | 80 | 02 | | | 0210 | | LXI | B,640 | |

| Addr | B1 | B2 | B3 | B4 | E | Line Label | Oped | Operand |
|------|----|----|----|----|---|------------|-------------------------------|--------------------|
| E4F6 | ED | 80 | | | | 0220 | LDIR | |
| E4F8 | CD | D1 | E4 | | | 0270 | CALL | PTSTNG |
| E4FB | 1B | | | | | 0272 | DB | 27 ;ESC |
| E4FC | 20 | 07 | | | | 0274 | DD | 2007H ;X=32 Y=7 |
| E4FE | 20 | 56 | 45 | 43 | | 0280 | DT | ' VECTOR GRAPHIC ' |
| E502 | 54 | 4F | 52 | 20 | | | | |
| E506 | 47 | 52 | 41 | 50 | | | | |
| E50A | 43 | 49 | 43 | 20 | | | | |
| E50E | 1B | | | | | 0290 | DB | 27 ;ESC |
| E50F | 20 | 08 | | | | 0300 | DD | 2008H ;X=32 Y=8 |
| E511 | 20 | 20 | 20 | 20 | | 0310 | DT | ' MONITOR ' |
| E515 | 4D | 4F | 4E | 49 | | | | |
| E519 | 54 | 4F | 52 | 20 | | | | |
| E51D | 20 | 20 | 20 | 20 | | | | |
| E521 | 1B | | | | | 0320 | DB | 27 ;ESC |
| E522 | 20 | 09 | | | | 0330 | DD | 2009H ;X=32 Y=9 |
| E524 | 20 | 20 | 56 | 45 | | 0340 | DT | ' VERSION 4.0 ' |
| E528 | 52 | 53 | 49 | 4F | | | | |
| E52C | 4E | 20 | 34 | 2E | | | | |
| E530 | 30 | 20 | 20 | 20 | | | | |
| E534 | 1B | | | | | 0350 | DB | 27 ;ESC |
| E535 | 00 | 8D | | | | 0360 | DD | 8DH ;X=0 Y=13 |
| E537 | C9 | | | | | 0380 | RET | |
| E538 | CD | CE | E4 | | | 0390 | CALL | RPTSTNG |
| E53B | 4D | 6F | 6E | 3E | | 0410 | DTH | 'Mon> ' |
| E53F | A0 | | | | | | | |
| E540 | 21 | 00 | F0 | | | 0420 | LXI | H, PAGE |
| E543 | 22 | DF | FF | | | 0430 | SHLD | TOSCN ;FULL SCROLL |
| E546 | C9 | | | | | 0440 | RET | |
| E547 | | | | | | 0450 | * | |
| E547 | | | | | | 0460 | *WIDE ASCII DUMP | |
| E547 | CD | D1 | E4 | | | 0470 | WASCII | CALL PTSTNG |
| E54A | 41 | 53 | 43 | 49 | | 0480 | | DTH 'ASCII DUMP ' |
| E54E | 49 | 20 | 44 | 55 | | | | |
| E552 | 4D | 50 | A0 | | | | | |
| E553 | CD | 0E | E1 | | | 0490 | CALL | TAHEX |
| E553 | CD | 9B | E5 | | | 0500 | CALL | HOMEC |
| E55B | | | | | | 0510 | * MAKE A RULER FOR ASCII DUMP | |
| E55B | 78 | | | | | 0520 | RULELP | MOV A,B |
| E55C | FE | 40 | | | | 0530 | | CPI 64 |
| E55E | 28 | 1A | | | | 0540 | JRZ | TERMLIN |
| E560 | E6 | 0F | | | | 0550 | ANI | OFH |
| E562 | 28 | 10 | | | | 0560 | JRZ | NUMBER |
| E564 | E6 | 03 | | | | 0570 | ANI | 3 |
| E566 | 23 | 03 | | | | 0580 | JRZ | MARKER |
| E568 | 3E | 20 | | | | 0590 | MVI | A, ' ' |
| E56A | CD | 8A | E3 | | | 0600 | REENTR | VIDEO |
| E56D | 04 | | | | | 0610 | INR | B |
| E56E | 18 | E3 | | | | 0620 | JR | RULELP |
| E570 | 3E | 6C | | | | 0630 | MARKER | MVI A, '1' |
| E572 | 18 | F6 | | | | 0640 | JR | REENTR |
| E574 | 73 | | | | | 0650 | NUMBER | MOV A,B |
| E575 | CD | 2D | E2 | | | 0660 | | CALL BINH |
| E578 | 18 | F3 | | | | 0670 | JR | REENTR+3 |
| E57A | CD | 88 | E3 | | | 0680 | * TOGGLE REVERSE VIDEO | |
| E57A | CD | 88 | E3 | | | 0690 | TERMLIN | CALL TVIDEO |

Extended Systems Monitor User's Manual

Page 17

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opnd | Operand |
|------|----|----|----|----|---|------|--------------------|-------|------------|
| E57D | CD | 07 | E6 | | | 0710 | WDMP1 | CALL | SETSCRLL |
| E580 | CD | 0F | E2 | | | 0720 | | CALL | PTAD |
| E583 | OE | 3F | | | | 0730 | | MVI | C,63 |
| E585 | CD | 8C | E5 | | | 0740 | | CALL | WDMP2 |
| E588 | FA | 7D | E5 | | | 0750 | | JM | WDMP1 |
| E58B | C8 | | | | | 0760 | | RZ | |
| E58C | 7E | | | | | 0770 | WDMP2 | MOV | A,M |
| E58D | 47 | | | | | 0780 | | MOV | B,A |
| E58E | 3E | 05 | | | | 0790 | | MVI | A,'E'-64 |
| E590 | CD | 8A | E3 | | | 0800 | | CALL | VIDEO |
| E593 | CD | 3F | E2 | | | 0810 | | CALL | BMP |
| E596 | C8 | | | | | 0820 | | RZ | |
| E597 | 0D | | | | | 0830 | | DCR | C |
| E593 | F8 | | | | | 0840 | | RM | |
| E599 | 18 | F1 | | | | 0850 | | JR | WDMP2 |
| E598 | | | | | | 0860 | * HOME CURSOR, | PRINT | "ADDR" |
| E598 | CD | CE | E4 | | | 0870 | HOME | CALL | RPTSTNG |
| E59E | 14 | | | | | 0890 | | DB | 'T'-64 |
| E59F | 41 | 44 | 44 | 52 | | 0900 | | DTH | 'ADDR' |
| E5A3 | A0 | | | | | | | | |
| E5A4 | 06 | 00 | | | | 0910 | | MVI | B,0 |
| E5A6 | 3E | 18 | | | | 0920 | | MVI | A,24 |
| E5A8 | 32 | DE | FF | | | 0930 | | STA | WIDTH |
| E5AB | C9 | | | | | 0940 | | RET | |
| E5AC | | | | | | 0950 | * MAKE A RULER | FOR | HEX DUMP |
| E5AC | 78 | | | | | 0960 | HEXRULER | MOV | A,B |
| E5AD | FE | 10 | | | | 0970 | | CPI | 16 |
| E5AF | 28 | 06 | | | | 0980 | | JRZ | HEXRCT |
| E5B1 | CD | 2F | E7 | | | 0990 | | CALL | PT2S |
| E5B4 | 04 | | | | | 1000 | | INR | B |
| E5B5 | 18 | F5 | | | | 1010 | | JR | HEXRULER |
| E5B7 | | | | | | 1020 | * EXTEND FOR ASCII | | |
| E5B7 | CD | DA | E0 | | | 1030 | HEXRCT | CALL | SPCE |
| E5BA | CD | DA | E0 | | | 1040 | | CALL | SPCE |
| E5BD | 06 | 00 | | | | 1050 | | MVI | B,0 |
| E5BF | 78 | | | | | 1060 | HEXRLP | MOV | A,B |
| E5C0 | FE | 10 | | | | 1070 | | CPI | 16 |
| E5C2 | C8 | | | | | 1080 | | RZ | |
| E5C3 | E6 | 0F | | | | 1090 | | ANI | OFH |
| E5C5 | CD | 31 | E2 | | | 1100 | | CALL | BINL |
| E5C8 | 04 | | | | | 1110 | | INR | B |
| E5C9 | 18 | F4 | | | | 1120 | | JR | HEXRLP |
| E5CB | | | | | | 1130 | * HEX DUMP ROUTINE | | |
| E5CB | CD | D1 | E4 | | | 1140 | HEXRUL | CALL | RPTSTNG |
| E5CE | 48 | 45 | 53 | 20 | | 1150 | | DTH | 'HEX DUMP' |
| E5D2 | 44 | 55 | 4D | 50 | | | | | |
| E5D6 | A0 | | | | | | | | |
| E5D7 | CD | 0E | E1 | | | 1160 | | CALL | TAHEX |
| E5DA | CD | 98 | E5 | | | 1170 | | CALL | HOME |
| E5DD | CD | AC | E5 | | | 1180 | | CALL | HEXRULER |
| E5E0 | CD | 38 | E3 | | | 1200 | | CALL | TVIDEO |
| E5E3 | CD | 07 | E6 | | | 1210 | | CALL | SETSCRLL |
| E5E6 | CD | 0F | E2 | | | 1220 | HLP1 | CALL | PTAD |
| E5E9 | E5 | | | | | 1230 | | PUSH | H |
| E5EA | D5 | | | | | 1240 | | PUSH | D |
| E5EB | OE | 10 | | | | 1250 | | MVI | C,16 |

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opcd | Operand |
|------|----|----|----|----|---|------|----------------------------|--------|-------------|
| E5ED | 7E | | | | | 1260 | HLP2 | MOV | A,H |
| E5EE | CD | 2F | E7 | | | 1270 | | CALL | PT2S |
| E5F1 | 23 | | | | | 1280 | | INX | H |
| E5F2 | 0D | | | | | 1290 | | DCR | C |
| E5F3 | C2 | ED | E5 | | | 1300 | | JNZ | HLP2 |
| E5F6 | D1 | | | | | 1310 | | POP | D |
| E5F7 | E1 | | | | | 1320 | | POP | H |
| E5F8 | 0E | 0F | | | | 1330 | | MVI | C,15 |
| E5FA | CD | DA | E0 | | | 1340 | | CALL | SPCE |
| E5FD | CD | DA | E0 | | | 1350 | | CALL | SPCE |
| E600 | CD | 8C | E5 | | | 1360 | | CALL | WDMP2 |
| E603 | FA | E3 | E5 | | | 1370 | | JM | HLP1-3 |
| E605 | C9 | | | | | 1380 | | RET | |
| E607 | | | | | | 1390 | * CHECK TO SET | SCROLL | POINT |
| E607 | 3A | DE | FF | | | 1400 | SETSCRLL | LDA | WIDTH |
| E60A | 3D | | | | | 1410 | | DCR | A |
| E60B | 32 | DE | FF | | | 1420 | | STA | WIDTH |
| E60E | 20 | 07 | | | | 1430 | | JRNZ | CTSCRL |
| E610 | 01 | 50 | F0 | | | 1440 | | LXI | B, PAGE+50H |
| E613 | ED | 43 | DF | FF | | 1450 | | SBCD | TOSCN |
| E617 | C9 | | | | | 1460 | CTSCRL | RET | |
| E618 | | | | | | 1470 | * | | |
| E618 | | | | | | 1480 | * PROGRAM MEMORY | | |
| E618 | CD | D1 | E4 | | | 1490 | PROGRAM | CALL | PTSTNG |
| E61B | 50 | 52 | 4F | 47 | | 1500 | | DTH | 'PROGRAM' |
| E61F | 52 | 41 | 4D | A0 | | | | | |
| E623 | CD | BD | E0 | | | 1510 | | CALL | AHEX |
| E626 | ED | 53 | E1 | FF | | 1520 | | SDED | TCURPOS |
| E62A | CD | 9B | E5 | | | 1530 | | CALL | HOMEC |
| E62D | CD | AC | E5 | | | 1540 | | CALL | HEXRULER |
| E630 | CD | 88 | E3 | | | 1560 | | CALL | TVIDEO |
| E633 | AF | | | | | 1570 | | XRA | A |
| E634 | 32 | DE | FF | | | 1580 | | STA | WIDTH |
| E637 | CD | A1 | E6 | | | 1590 | | CALL | PRT1LINE |
| E63A | CD | 2F | E1 | | | 1600 | POLLOOP | CALL | ESCAPE |
| E63D | CD | ED | E0 | | | 1610 | | CALL | HEX |
| E640 | 2A | E1 | FF | | | 1620 | | LHLD | TCURPOS |
| E643 | 30 | 1A | | | | 1630 | | JRNC | MODMEM |
| E645 | | | | | | 1640 | * CONTROL CODE TABLE | | |
| E645 | FE | 20 | | | | 1650 | | CPI | ' ' |
| E647 | 23 | 46 | | | | 1660 | | JRZ | CSRT |
| E649 | FE | 03 | | | | 1670 | | CPI | '8' |
| E64B | 28 | 45 | | | | 1680 | | JRZ | CSLT |
| E64D | FE | 12 | | | | 1690 | | CPI | 'R'-64 |
| E64F | 28 | 39 | | | | 1700 | | JRZ | CSDN |
| E651 | FE | 15 | | | | 1710 | | CPI | 'U'-64 |
| E653 | 28 | 2F | | | | 1720 | | JRZ | CSUP |
| E655 | FE | 17 | | | | 1730 | | CPI | 'W'-64 |
| E657 | 28 | 39 | | | | 1740 | | JRZ | CSLT |
| E659 | FE | 1A | | | | 1750 | | CPI | 'Z'-64 |
| E65B | 28 | 32 | | | | 1760 | | JRZ | CSRT |
| E65D | 18 | DB | | | | 1770 | | JR | POLLOOP |
| E65F | | | | | | 1780 | * MODIFY A MEMORY LOCATION | | |
| E65F | 2A | E1 | FF | | | 1790 | MODMEM | LHLD | TCURPOS |
| E662 | 4F | | | | | 1800 | | MOV | C,A |
| E663 | 3A | DE | FF | | | 1810 | | LDA | WIDTH |

Extended Systems Monitor User's Manual

Page 19

| Addr | B1 | B2 | B3 | B4 | S | Line | Label | Opnd | Operand |
|------|----|----|----|----|---|------|---------------------------------|------|-----------|
| E666 | A7 | | | | | 1820 | | ANA | A |
| E667 | 7E | | | | | 1830 | | MOV | A,M |
| E668 | 28 | 0D | | | | 1840 | | JRZ | LSNIBL |
| E66A | E6 | F0 | | | | 1850 | | ANI | OF0H |
| E66C | B1 | | | | | 1860 | | ORA | C |
| E66D | 77 | | | | | 1870 | REMEM | MOV | M,A |
| E66E | 3A | DE | FF | | | 1880 | | LDA | WIDTH |
| E671 | EE | 01 | | | | 1890 | | XRI | 1 |
| E673 | 20 | 1F | | | | 1900 | | JRNZ | RTRTN+1 |
| E675 | 18 | 18 | | | | 1910 | | JR | CSRT |
| E677 | 17 | | | | | 1920 | LSNIBL | RAE | |
| E678 | 17 | | | | | 1930 | | RAL | |
| E679 | 17 | | | | | 1940 | | RAL | |
| E67A | 17 | | | | | 1950 | | RAL | |
| E67B | E6 | F0 | | | | 1960 | | ANI | OF0H |
| E67D | B1 | | | | | 1970 | | ORA | C |
| E67E | 0F | | | | | 1980 | | RRC | |
| E67F | 0F | | | | | 1990 | | RRC | |
| E680 | 0F | | | | | 2000 | | RRC | |
| E681 | 0F | | | | | 2010 | | RRC | |
| E682 | 18 | E9 | | | | 2020 | | JR | REMEM |
| E684 | 11 | F0 | FF | | | 2030 | * MOVE UP ONE LINE | | |
| E684 | 11 | F0 | FF | | | 2040 | CSUP | LXI | D,-16 |
| E687 | 19 | | | | | 2050 | | DAD | D |
| E688 | 18 | 09 | | | | 2060 | | JR | RTRTN |
| E68A | | | | | | 2070 | * MOVE DOWN ONE LINE | | |
| E68A | 11 | 10 | 00 | | | 2080 | CSDN | LXI | D,16 |
| E68D | 18 | F8 | | | | 2090 | | JR | CSUP+3 |
| E68F | | | | | | 2100 | * MOVE RIGHT ONE SPACE | | |
| E68F | 23 | | | | | 2110 | CSRT | INX | H |
| E690 | 13 | 01 | | | | 2120 | | JR | RTRTN |
| E692 | 2B | | | | | 2130 | * MOVE LEFT ONE SPACE | | |
| E692 | 2B | | | | | 2140 | CSLT | DCX | H |
| E693 | | | | | | 2150 | * | | |
| E693 | AF | | | | | 2160 | RTRTN | XRA | A |
| E694 | 32 | DE | FF | | | 2170 | | STA | WIDTH |
| E697 | 22 | E1 | FF | | | 2180 | | SHLD | TCURPOS |
| E69A | 3E | 15 | | | | 2190 | UPAROW | MVI | A,'U'-64 |
| E69C | CD | 8A | E3 | | | 2200 | | CALL | VIDEO |
| E69F | 18 | 96 | | | | 2210 | | JR | POLLOOP-3 |
| E6A1 | | | | | | 2220 | * PRINT A LINE CONTAINING ((H)) | | |
| E6A1 | 2A | E1 | FF | | | 2230 | PRT1LINE | LHLD | TCURPOS |
| E6A4 | E5 | | | | | 2240 | | PUSH | H |
| E6A5 | D1 | | | | | 2250 | | POP | D |
| E6A6 | 7D | | | | | 2260 | | MOV | A,L |
| E6A7 | F6 | 0F | | | | 2270 | | ORI | OFH |
| E6A9 | 5F | | | | | 2280 | | MOV | E,A |
| E6AA | E6 | F0 | | | | 2290 | | ANI | OF0H |
| E6AC | 6F | | | | | 2300 | | MOV | L,A |
| E6AD | CD | E6 | E5 | | | 2310 | | CALL | HLP1 |
| E6B0 | | | | | | 2320 | * NOW PUT CURSOR WHERE IT GOES | | |
| E6B0 | CD | 6F | E4 | | | 2330 | | CALL | LIFTCURS |
| E6B3 | 2A | E1 | FF | | | 2340 | | LHLD | TCURPOS |
| E6B6 | 7D | | | | | 2350 | | MOV | A,L |
| E6B7 | E6 | 0F | | | | 2360 | | ANI | OFH |
| E6B9 | 6F | | | | | 2370 | | MOV | L,A |

| Addr | B1 | B2 | B3 | B4 | S | Line | Label | Opcd | Operand |
|------|----|----|----|----|---|------|---|------|-------------|
| E6BA | 3E | 05 | | | | 2380 | | MVI | A,5 |
| E6BC | 2D | | | | | 2390 | PLOP1 | DCR | L |
| E6BD | FA | C4 | E6 | | | 2400 | | JM | PGCONT |
| E6C0 | C6 | 03 | | | | 2410 | | ADI | 3 |
| E6C2 | 18 | F8 | | | | 2420 | | JR | PLOP1 |
| E6C4 | 6F | | | | | 2430 | PGCONT | MOV | L,A |
| E6C5 | 3A | DE | FF | | | 2440 | | LDA | WIDTH |
| E6C8 | 85 | | | | | 2450 | | ADD | L |
| E6C9 | | | | | | 2460 | * A = 5+3*L+W | | |
| E6C9 | 32 | DB | FF | | | 2470 | | STA | CURPOS |
| E6CC | C3 | 6F | E4 | | | 2480 | | JMP | LIFTCURS |
| E6CF | | | | | | 2490 | * | | |
| E6CF | | | | | | 2500 | * | | |
| E6CF | | | | | | 2510 | * DISPLAY REGISTERS | | |
| E6CF | CD | D1 | E4 | | | 2520 | DREGS | CALL | PTSTNG |
| E6D2 | 52 | 45 | 47 | 49 | | 2530 | | DTH | 'REGISTERS' |
| E6D6 | 53 | 54 | 45 | 52 | | | | | |
| E6DA | D3 | | | | | | | | |
| E6DB | | | | | | 2540 | * DUMP REGISTERS AFTER ENTRY FROM RST 7 | | |
| E6DB | E3 | | | | | 2550 | DUMPREGS | XTHL | |
| E6DC | F5 | | | | | 2560 | | PUSH | PSW |
| E6DD | CD | 35 | E7 | | | 2570 | | CALL | DISPREGS |
| E6E0 | 2B | | | | | 2580 | | DCX | H |
| E6E1 | CD | 0F | E2 | | | 2590 | | CALL | PTAD |
| E6E4 | E1 | | | | | 2600 | | POP | H |
| E6E5 | C5 | | | | | 2610 | | PUSH | B |
| E6E6 | CD | 8A | E7 | | | 2620 | | CALL | PRTFLGS |
| E6E9 | C1 | | | | | 2630 | | POP | B |
| E6EA | CD | 12 | E2 | | | 2640 | | CALL | PTAD+3 |
| E6ED | E1 | | | | | 2650 | | POP | H |
| E6EE | 22 | E3 | FF | | | 2660 | | SHLD | HLTEMP |
| E6F1 | CD | AB | E7 | | | 2670 | | CALL | PTHREE |
| E6F4 | DD | E5 | | | | 2680 | | PUSH | IX |
| E6F6 | E1 | | | | | 2690 | | POP | H |
| E6F7 | CD | 12 | E2 | | | 2700 | | CALL | PTAD+3 |
| E6FA | FD | E5 | | | | 2710 | | PUSH | IY |
| E6FC | E1 | | | | | 2720 | | POP | H |
| E6FD | CD | 12 | E2 | | | 2730 | | CALL | PTAD+3 |
| E700 | 21 | 00 | 00 | | | 2740 | | LXI | H,0 |
| E703 | 39 | | | | | 2750 | | DAD | SP |
| E704 | 22 | E5 | FF | | | 2760 | | SHLD | SPTEMP |
| E707 | CD | 12 | E2 | | | 2770 | | CALL | PTAD+3 |
| E70A | 08 | | | | | 2780 | | EXAF | |
| E70B | F5 | | | | | 2790 | | PUSH | PSW |
| E70C | E1 | | | | | 2800 | | POP | H |
| E70D | CD | 12 | E2 | | | 2810 | | CALL | PTAD+3 |
| E710 | D9 | | | | | 2820 | | EXX | |
| E711 | CD | AB | E7 | | | 2830 | | CALL | PTHREE |
| E714 | D9 | | | | | 2840 | | EXX | |
| E715 | 0A | | | | | 2850 | | LDAX | B |
| E716 | CD | 2F | E7 | | | 2860 | | CALL | PT2S |
| E719 | 1A | | | | | 2870 | | LDAX | D |
| E71A | CD | 2F | E7 | | | 2880 | | CALL | PT2S |
| E71D | 2A | E3 | FF | | | 2890 | | LHLD | HLTEMP |
| E720 | 7E | | | | | 2900 | | MOV | A,M |
| E721 | CD | 2F | E7 | | | 2910 | | CALL | PT2S |

Extended Systems Monitor User's Manual

Page 21

| Addr | B1 | B2 | B3 | B4 | E | Line | Label | Opcd | Operand |
|------|----|----|----|----|---|------|-------------------------------------|------|-----------------------|
| E724 | 2A | E5 | FF | | | 2920 | | LHLD | SPTEMP |
| E727 | F9 | | | | | 2930 | | SPHL | |
| E728 | E1 | | | | | 2940 | | POP | H |
| E729 | CD | 12 | E2 | | | 2950 | | CALL | PTAD+3 |
| E72C | C3 | 46 | E0 | | | 2960 | | JMP | CLRBRK |
| E72F | | | | | | 2970 | * | | ;CLEAR BREAKPOINT |
| E72F | CD | 26 | E2 | | | 2980 | PT2S | CALL | PT2 |
| E732 | C3 | DA | E0 | | | 2990 | | JMP | SPCE |
| E735 | | | | | | 3000 | * DISPLAY REGISTER HEADER ON SCREEN | | |
| E735 | CD | CE | E4 | | | 3010 | DISPREGS | CALL | RPTSTNG |
| E738 | 14 | | | | | 3020 | | DB | 'T'-64 |
| E739 | 41 | 44 | 44 | 52 | | 3040 | | DT | 'ADDR FLAGS AF BC DE' |
| E73D | 20 | 46 | 4C | 41 | | | | | |
| E741 | 47 | 53 | 20 | 20 | | | | | |
| E745 | 41 | 46 | 20 | 20 | | | | | |
| E749 | 20 | 42 | 43 | 20 | | | | | |
| E74D | 20 | 20 | 44 | 45 | | | | | |
| E751 | 20 | 20 | 20 | 48 | | 3050 | | DT | ' HL IX IY SP ' |
| E755 | 4C | 20 | 20 | 20 | | | | | |
| E759 | 49 | 53 | 20 | 20 | | | | | |
| E75D | 20 | 49 | 59 | 20 | | | | | |
| E761 | 20 | 20 | 53 | 50 | | | | | |
| E765 | 20 | | | | | | | | |
| E766 | 20 | 20 | 41 | 46 | | 3060 | | DT | ' AF ' |
| E76A | 27 | | | | | 3070 | | DB | 27H |
| E76B | 20 | 20 | 42 | 43 | | 3080 | | DT | ' BC ' |
| E76F | 27 | | | | | 3090 | | DB | 27H |
| E770 | 20 | 20 | 44 | 45 | | 3100 | | DT | ' DE ' |
| E774 | 27 | | | | | 3110 | | DB | 27H |
| E775 | 20 | 20 | 48 | 4C | | 3120 | | DT | ' HL ' |
| E779 | 27 | | | | | 3130 | | DB | 27H |
| E77A | 20 | 40 | 42 | 20 | | 3140 | | DT | ' 0B 0D 0H 0SP ' |
| E77E | 40 | 44 | 20 | 40 | | | | | |
| E782 | 48 | 20 | 40 | 53 | | | | | |
| E786 | 50 | 20 | | | | | | | |
| E788 | 94 | | | | | 3150 | | DB | 'T'+64 |
| E789 | C9 | | | | | 3160 | | RET | |
| E78A | | | | | | 3170 | * | | |
| E78A | | | | | | 3180 | * PRINT FLAGS | | |
| E78A | 01 | 5A | 40 | | | 3190 | PRTFLGS | LXI | B, 405AH |
| E78D | CD | BA | E7 | | | 3200 | | CALL | MASKFLG |
| E790 | 01 | 43 | 01 | | | 3210 | | LXI | B, 143H |
| E793 | CD | BA | E7 | | | 3220 | | CALL | MASKFLG |
| E796 | 01 | 4D | 80 | | | 3230 | | LXI | B, 804DH |
| E799 | CD | BA | E7 | | | 3240 | | CALL | MASKFLG |
| E79C | 01 | 45 | 04 | | | 3250 | | LXI | B, 445H |
| E79F | CD | BA | E7 | | | 3260 | | CALL | MASKFLG |
| E7A2 | 01 | 48 | 10 | | | 3270 | | LXI | B, 1043H |
| E7A5 | CD | BA | E7 | | | 3280 | | CALL | MASKFLG |
| E7A8 | C3 | DA | E0 | | | 3290 | | JMP | SPCE |
| E7AB | | | | | | 3300 | * | | |
| E7AB | | | | | | 3310 | * PRINT BC DE HL IN ORDER | | |
| E7AB | E5 | | | | | 3320 | PTHREE | PUSH | H |
| E7AC | C5 | | | | | 3330 | | PUSH | B |
| E7AD | E1 | | | | | 3340 | | POP | H |
| E7AE | CD | 12 | E2 | | | 3350 | | CALL | PTAD+3 |

| Address | 31 | 32 | 33 | 34 | 35 | Line Label | Opnd | Operands |
|---------|----|----|----|----|----|--|-----------|---------------------------|
| 57B1 | D5 | | | | | 3360 | PUSH | D |
| 57B2 | E1 | | | | | 3370 | POP | H |
| 57B3 | CD | 12 | E2 | | | 3380 | CALL | PTAD+3 |
| 57B6 | E1 | | | | | 3390 | POP | H |
| 57B7 | C3 | 12 | E2 | | | 3400 | JMP | PTAD+3 |
| 57BA | | | | | | 3410 * | | |
| 57BA | 7D | | | | | 3420 MASKFLG | MOV | A,L |
| 57B9 | A0 | | | | | 3430 | ANA | B |
| 57B0 | 3E | 20 | | | | 3440 | MVI | A,20H |
| 57B2 | CA | 3A | E3 | | | 3450 | JZ | VIDEO |
| 57C1 | 79 | | | | | 3460 | MOV | A,C |
| 57C2 | C3 | 3A | E3 | | | 3470 | JMP | VIDEO |
| 57C5 | | | | | | 3480 * | | |
| 57C5 | | | | | | 3490 * SET BREAKPOINT | | |
| 57C5 | CD | D1 | E4 | | | 3500 SETBRK | CALL | PTSTNG |
| 57C3 | 42 | 52 | 45 | 41 | | 3510 | OTH | 'BREAK AT ' |
| 57C0 | 48 | 20 | 41 | 54 | | | | |
| 57D0 | A0 | | | | | | | |
| 57D1 | CD | 3D | E0 | | | 3520 | CALL | AHEX |
| 57D4 | 1A | | | | | 3530 | LDAX | D |
| 57D5 | 32 | E9 | FF | | | 3540 | STA | BRKCODE |
| 57D6 | ED | 53 | E7 | FF | | 3550 | SPED | BKPTLOC |
| 57D2 | 3E | FF | | | | 3560 | MVI | A,OFFH |
| 57D8 | 12 | | | | | 3570 | STAX | D ;RST 7 |
| 57D8 | C9 | | | | | 3580 | RET | |
| 57E0 | | | | | | 3590 * | | |
| 57E0 | | | | | | 3600 * EXTERNAL COMMUNICATIONS | | |
| 57E0 | CD | D1 | E4 | | | 3610 EXTCOM | CALL | PTSTNG |
| 57E3 | 46 | 53 | 54 | 20 | | 3620 | OTH | 'EXT COM ' |
| 57E7 | 43 | 4F | 4D | A0 | | | | |
| 57EB | D8 | 05 | | | | 3630 RECEIVE | IN | 5 |
| 57E9 | D8 | 02 | | | | 3640 | ANI | 2 |
| 57EF | 23 | 05 | | | | 3650 | JRZ | NEXCHR |
| 57F1 | D8 | 04 | | | | 3660 | IN | 4 |
| 57F3 | CD | 3A | E3 | | | 3670 | CALL | VIDEO |
| 57F6 | CD | 2F | E1 | | | 3680 NEXCHR | CALL | ESCAPE |
| 57F9 | 28 | 50 | | | | 3690 | JRZ | RECEIVE |
| 57FB | D3 | 04 | | | | 3700 | OUT | 4 |
| 57FD | 18 | 5C | | | | 3710 | JR | RECEIVE |
| 57FF | | | | | | 3720 * | | |
| 57FF | | | | | | 3730 * TEMPORARY STORAGE LOCATIONS FOR REGISTERS, ETC. | | |
| 5FF3 | 00 | 00 | | | | 3740 ORG | TCURPOS+2 | |
| 5FF5 | 00 | 00 | | | | 3750 HLTEMP | DW | 0 |
| 5FF6 | 00 | 00 | | | | 3760 SPTEMP | DW | 0 |
| 5FF7 | E9 | FF | | | | 3770 BKPTLOC | DW | BRKCODE ;BREAKPT LOCATION |
| 5FF9 | 00 | | | | | 3780 BRKCODE | DB | 0 ;CODE AT BREAKPT |
| 5FFA | 00 | | | | | 3790 XYFLAG | DB | 0 ;CURSOR XY FLAG |

